

Appendix B

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Refuge recreation

Findings of Appropriateness and Compatibility Determinations

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- Wildlife Observation and Photography
- Recreational Fishing
- Research Conducted by Non-Service Personnel
- Commercial Guides, Tours, and Outfitting
- Outdoor Events and Ceremonies
- Non-Motorized Boat Landing and Launching
- Beachcombing
- Sunbathing and Swimming
- Organized Picnicking
- Beach Sports and Kite Flying
- Bicycling
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COMPATIBILITY DETERMINATION

USE:

Environmental Education and Interpretation

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [16 U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

Environmental education includes activities which seek to increase public knowledge and understanding of wildlife and the importance of habitat protection and management. Typical activities include teacher or staff-guided onsite field trips, offsite programs in classrooms, and nature study, such as teacher and student workshops and curriculum-structured instruction. Interpretation includes activities and supporting infrastructure that explain management activities, fish, and wildlife resources, ecological processes, and cultural history among other topics to public users.

Access to Nantucket NWR for these activities can be achieved by boat, over-sand vehicle (OSV), or foot. The Trustees of Reservations (TTOR) currently conducts interpretation on Nantucket NWR through seasonal natural and cultural history guided tours. They also conduct interpretation through staff at a regulated gate house and roving rangers which engage in frequent public interactions both on- and offsite. Additional opportunities exist for expanded environmental education (perhaps through local school systems or environmental organizations) and interpretation (improved signage or kiosk installment on the refuge).

This use can be conducted onsite or offsite. When on site, the use is primarily facilitated by operation of over-sand vehicles, which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees

of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common. Over-sand vehicles are also used by Service staff and TTOR when conducting biological surveys, roving interpretation, and natural and cultural history tours.

TTOR requires OSV permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR) and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(b) Is the use a priority public use?

Environmental education and interpretation are both identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997.

(c) Where would the use be conducted?

Environmental education and interpretation could occur on any areas of Nantucket NWR that are open to public access. Public access is dictated by wildlife use and presence of sensitive vegetation. In general, much of the intertidal area and established vehicle trails through the dune system are open (at least to pedestrian traffic) for most of the year. Some areas of beach berm are closed seasonally to protect nesting shorebirds and seabirds. Public access is restricted from dune habitat to minimize trampling of American beach grass (*Ammophila breviligulata*), although the refuge staff may construct one trail from the lighthouse to the Atlantic Ocean beach that would provide access for interpretive activities, environmental education, and other wildlife-dependent recreation. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures. Information about closures will also be available on the refuge Web site or through TTOR.

Over-sand vehicles use is generally permitted on the beach berm from the high tide line to the base of the foredunes, as well as on established, officially designated OSV roads that bisect dunes in natural sand valleys. Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1) or in the wrack line, and are often prohibited from the very northern tip of the refuge to protect seals (Zone 3). Specific OSV traffic routes in other zones have varied annually and seasonally depending on wildlife use and public safety. For instance, Federal and State regulations require minimum buffer areas for various nesting species of shorebirds and seabirds. Depending on where birds nest and the shifting geomorphology of the dunes and intertidal habitat, it may be impossible to safely allow OSV access along a beach if the berm is narrow and the buffer required by nesting birds effectively extends below the high water line. Buffer distances may differ during the incubation period (when birds are tending to eggs and may require less area) and the chick rearing period (when some species are mobile foragers and may need a larger buffer of undisturbed habitat), resulting in changes in access within a season. Generally, Zone 4 will be closed to OSV access seasonally to protect nesting birds, and Zone 5 will be closed to OSV access seasonally to minimize disturbance to staging birds. However, locations of these closures may shift annually or within a season.

Additionally, sometimes nesting birds on Coskata-Coatue Wildlife Refuge (directly south of Nantucket NWR) will result in OSV closures and essentially limit OSV access to all northerly areas as well. Over-sand vehicle users will be informed at the Wauwinet Gatehouse of areas open to OSV travel, but because the location of nesting birds and changes in geomorphology cannot always be predicted, sudden changes in access may occur.

(d) When would the use be conducted?

Nantucket NWR is open to the public for environmental education and interpretation from ½ hour before sunrise to ½ hour after sunset. Environmental education and interpretation could occur on site any time of the year in any areas open to public access. Use for these activities is likely to be highest in late spring, summer, and early fall.

(e) How would the use be conducted?

Environmental education and interpretation must be conducted in accordance with refuge regulations (including seasonal closures). Onsite environmental education and other organized tours require a special use permit if not conducted by refuge staff. These activities would be conducted by visitors walking on the refuge, and/or driving to and on the refuge by personal OSV or an OSV operated by refuge partners or permittees. Walking would take place on open sections of the refuge beach, the sand road from the adjacent Coskata-

Coatue Wildlife Refuge owned by The Trustees of Reservations (TTOR), and on a new, to be established trail from the lighthouse to the beach.

Refuge visitors would primarily access the refuge by personal OSV, although some visitors engaged in interpretation and education will access the refuge by four-wheeled drive vans operated by refuge partners or permittees. A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is the use being proposed?

Environmental education and interpretation are both identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997. Although small, Nantucket NWR serves as a great example of dynamic barrier beach habitat that is constantly impacted by wind and tidal energy. Seals and a variety of bird species use Nantucket NWR and surrounding waters year round. Affording opportunities for public learning will increase visitor appreciation and foster a greater awareness of the importance of this site to the National Wildlife Refuge System.

AVAILABILITY OF RESOURCES:

Environmental education and interpretation occur through the use of existing staff and resources, and a successful partnership with TTOR. Nantucket NWR is small, but the quality of these opportunities will be a direct reflection of the refuge's staff and funding levels and continued collaboration with TTOR and new relationships with other conservation partners. Updated, friendly signage is necessary to clarify refuge boundaries, seasonal closures, and permitted activities. Additionally, self interpretation would be greatly enhanced by a pamphlet and educational placards or kiosks that address barrier beach ecology. The estimated costs of allowing these uses is still minimal considering the benefits, because there is little infrastructure required beyond that already in place. A regular on site presence by seasonal refuge staff and TTOR provides a consistent message and increases voluntary compliance, and administration of these uses is done collectively in conjunction with other uses.

Design and print a pamphlet	1 staff	80 hours + cost	\$6,000
Purchase new signage and placards/kiosk			\$15,000
Install and maintain new signage	2 staff	40 hours each	\$3,200
Total Initial Cost of Program:			\$24,200
Prepare, deliver, and coordinate EE/interp	1 staff	400 hours	\$10,000
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Fuel and vehicle Costs			\$1,000
Brochure reprints			\$1,000
Total Annual Cost of Program:			\$14,850

Over-sand vehicle permits are currently administered by TTOR. Refuge staff time and resources are needed to ensure delineation of bird nesting and staging areas and seal haul-out areas (and otherwise closed areas) are accomplished on time, and sufficiently maintained to provide maximum protection for biological resources. Similarly, refuge staff presence will allow monitoring of biological resources and more timely reinstated access,

when appropriate. The Service does not estimate additional costs associated with OSV or pedestrian use, as permitting infrastructure is already in place by TTOR, and TTOR staff provide regular presence at the Wauwinet Gatehouse and on Nantucket NWR.

ANTICIPATED IMPACTS OF THE USE:

Because this activity will be supervised by Service or partner staff, impacts of environmental education and interpretation will likely be minimal if conducted in accordance with refuge regulations. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. In the event of persistent disturbance to habitat or wildlife, the activity will be further restricted or discontinued. Schoolchildren or participants in natural history tours conducted by partners may cause some disturbance to refuge visitors, but the amount of disturbance is expected to be minimal as the total number of interpretative tours (conducted by non-profit and/or commercial tour guides) that will occur on the refuge will not exceed more than two a day, and will not occur on a daily basis.

Placement of kiosks and interpretive panels may impact small areas of vegetation. Kiosks will be placed where minimal disturbance will occur both from the structures and visitors viewing the information provided on the structures.

Providing additional interpretive and educational brochures and materials may result in increased knowledge of the refuge and its resources. This awareness and knowledge may improve the willingness of the public to support refuge programs, resources, and compliance with regulations.

There are impacts to refuge wildlife, vegetation, and soils from pedestrian and OSV access for visitors engaged in environmental education and/or interpretation. These are described below.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A

literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced

increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback (2004, 2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle (ORV) use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep

ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown 2001, Morrison 1984, Myers 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_cuskata_coast_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Occasional law enforcement patrol and regular staff and conservation partner presence should minimize potential violations. The current “refuge open ½ hour before sunrise to ½ hour after sunset” regulation restricts entry after daylight hours and will be maintained. Refuge regulations will be posted and enforced.

Periodic evaluations will be done to insure that visitors and programs are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an ongoing basis to ensure visitor safety, compliance with State and Federal tern and plover guidelines, and to minimize impacts on vegetation and wildlife.

Special use permits are required for organizations conducting environmental education activities on Nantucket NWR. A fee may be charged for the special use permit. The areas used by such tours will be monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity may be prohibited. Specific conditions may apply depending upon the requested activity and will be addressed through the special use permit. Regulations to ensure the safety of all participants will also be included.

Continued permitting through TTOR at the Wauwinet Gatehouse will assist the dissemination of information about closures and other public use regulations on Nantucket NWR and also provide a means of tracking the number of annual OSV users.

Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds are sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds or seals. Areas where OSV use are allowed will be evaluated on an annual, seasonal, and sometimes daily basis and will be influenced by beach geomorphology as well as wildlife use. Updates on closures will be disseminated at the Wauwinet Gatehouse and on the refuge Web site.

Occasional law enforcement patrols and regular refuge and TTOR presence should minimize potential violations of refuge closures and other regulations (speed limits, tire deflation requirements, prohibition of dogs). If persistent violations or disturbance to natural resources occur, OSV access will be eliminated.

The refuge is a leave-no-trace, carry-in-carry out facility. All food containers, bottles, and other waste and refuse must be taken out. Littering, dumping, and abandoning property are prohibited by Federal regulation at 50 C.F.R. 27.93.94.

JUSTIFICATION:

Environmental education activities generally support refuge purposes and impacts can largely be minimized. The minor resource impacts attributed to these activities are generally outweighed by the benefits gained by educating present and future generations about refuge resources. Environmental education is a public use management tool used to develop a resource protection ethic within society. While it targets school age children, it is not limited to this group. This tool allows us to educate visitors about endangered and threatened species management, wildlife management and ecological principles and communities. A secondary benefit of environmental education is that it can instill stewardship in visitors and most likely reduces vandalism, littering, and poaching. Environmental education also strengthens Service visibility in the local community.

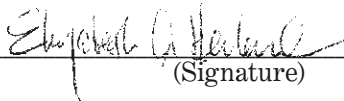
We do not expect pedestrian access to materially interfere with or detract from the mission of the National Wildlife Refuge System, nor diminish the purpose for which the refuge was established. It will not pose significant adverse effects on refuge resources, nor interfere with public use of the refuge, nor cause an undue administrative burden. These uses facilitate wildlife observation and photography, and will provide compatible recreational opportunities for visitors to observe and learn about wildlife and habitats firsthand.

Over-sand vehicle use facilitates five priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Allowing controlled OSV access will facilitate visitation, fostering a greater awareness and appreciation of the importance of this site to the National Wildlife Refuge System. Occasional law enforcement patrol and regular Service and TTOR presence should minimize potential violations of refuge regulations and closures, as previously described.

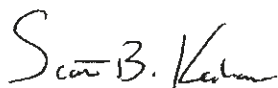
The vehicle limitations outlined in this determination provide maximum protection to prime nesting habitat for piping plovers and terns, as well as minimize disturbance to staging terns and resting seals. With proper monitoring, this use is not likely to materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that OSV use, at the discretion of the refuge manager, conducted as described including with stipulations, is sufficient.

Costs associated with administering environmental education and interpretation and resultant likely visitor impacts are minimal, although a staff person will be needed to deliver these programs to residents of Nantucket and refuge visitors. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that these uses, at the discretion of the refuge manager, are compatible uses and contribute to the purposes for which Nantucket NWR was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

9/11/2027

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull*. 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.

- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Burger, J., and M. Gochfeld. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. *Environmental Conservation* 25:13-21.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.

- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Îles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.

- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Saunders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

COMPATIBILITY DETERMINATION

USE:

Wildlife Observation and Photography

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

Wildlife observation and photography activities include walking on open and established trails to observe and/or photograph the natural environment. Access to Nantucket NWR for these activities can be achieved by boat, over-sand vehicle, or foot. In addition, The Trustees of Reservations (TTOR) conducts natural history tours that include Nantucket NWR which also provide opportunities for wildlife photography and observation.

The use is primarily facilitated by operation of over-sand vehicles, which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common. Over-sand vehicles are also used by Service staff and TTOR when conducting biological surveys, roving interpretation, and natural and cultural history tours.

TTOR requires OSV permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR) and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(b) Is the use a priority public use?

Wildlife observation and photography are both identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997.

(c) Where would the use be conducted?

Wildlife observation and photography could occur on any areas of Nantucket NWR that are open to public access. Public access is dictated by wildlife use and presence of sensitive vegetation. In general, much of the intertidal area and established vehicle trails through the dune system are open (at least to pedestrian traffic) for much of the year. Some areas of intertidal areas and beach berm are closed seasonally to protect seals, nesting shorebirds, and seabirds. Public access is restricted from dune habitat to minimize trampling of American beach grass (*Ammophila breviligulata*). An authorized trail will be established by the Service from the lighthouse to the beach on the Atlantic Ocean side of the refuge, and the public will be able to view wildlife and take photographs anywhere along this trail. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures, visit the refuge Web site, or obtain information about closures and refuge activities from The Trustees of Reservations (TTOR) staff at the Wauwinet Gatehouse.

Over-sand vehicle use is generally permitted on the beach berm from the high tide line to the base of the foredunes, as well as on established, officially designated OSV roads that bisect dunes in natural sand valleys. Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1) or in the wrack line, and are often prohibited from the very northern tip of the refuge to protect seals (Zone 3). Specific OSV traffic routes in other zones have varied annually and seasonally depending on wildlife use and public safety. For instance, Federal and State regulations require minimum buffer areas for various nesting species of shorebirds and seabirds. Depending on where birds nest and the shifting geomorphology of the dunes and intertidal habitat, it may be impossible to safely allow OSV access along a beach if the berm is narrow and the buffer required by nesting birds effectively extends below the high water line. Buffer distances may differ during the incubation period (when birds are tending to eggs and may require less area) and the chick rearing period (when some species are mobile foragers and may need a larger buffer of undisturbed habitat), resulting in changes in access within a season. Generally, Zone 4 will be closed to OSV access seasonally to protect nesting birds, and Zone 5 will be closed to OSV access seasonally to minimize disturbance to staging birds. However, locations of these closures may shift annually or within a season.

Additionally, sometimes nesting birds on Coskata-Coatue Wildlife Refuge (directly south of Nantucket NWR) will result in OSV closures and essentially limit OSV access to all northerly areas as well. Over-sand vehicle users will be informed at the Wauwinet Gatehouse of areas open to OSV travel, but because the location of nesting birds and changes in geomorphology cannot always be predicted, sudden changes in access may occur.

(d) When would the use be conducted?

Nantucket NWR is open to the public for wildlife observation and photography from ½ hour before sunrise to ½ hour after sunset. Wildlife observation and photography could occur any time of the year in any areas open to public access. Use for these activities is likely to be highest in late spring, summer, and early fall.

(e) How would the use be conducted?

Wildlife observation and photography must be conducted in accordance with refuge regulations (including seasonal closures). Photography blinds are not permitted on the refuge, even in areas generally open to the public, without a special use permit. Commercial photography on Nantucket NWR also requires a special use permit.

Refuge visitors would primarily access the refuge by personal OSV, although some visitors engaged in wildlife photography and observation as part of a tour group will access the refuge by four-wheeled drive vans operated by refuge partners. A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated

at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is the use being proposed?

Wildlife observation and photography are both identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997. Although small, Nantucket NWR serves as a great example of dynamic barrier beach habitat that is constantly impacted by wind and tidal energy. A variety of bird species use Nantucket NWR and surrounding waters year round. The refuge also hosts a sizeable seal population much of the year. Affording opportunities for public enjoyment will increase visitor appreciation and foster a greater awareness of the importance of this site to the National Wildlife Refuge System.

AVAILABILITY OF RESOURCES:

Wildlife observation and photography occur through the use of existing staff and resources, which is largely enhanced through our partnership with TTOR. Nantucket NWR is small, but the quality of these opportunities will be a direct reflection of the refuge's staff and funding levels and continued successful collaboration with TTOR. Updated, friendly signage is necessary to clarify refuge boundaries, seasonal closures, and permitted activities. The estimated costs of allowing these uses is reasonable because there is little infrastructure involved, and existing staff and TTOR staff are often onsite, providing a regular presence which increases voluntary compliance. Administration of these uses is done collectively in conjunction with other uses.

Purchase new signage			\$5,000
Install and maintain new signage	2 staff	40 hours each	\$1,000
Total Initial Cost of Program:			\$6,000
Maintain signage and information			\$1,000
Seasonal onsite staff	1 staff	200 hours	\$5,000
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Fuel and Vehicle Costs			\$1,000
Total Annual Cost of Program:			\$9,000

Over-sand vehicle permits are currently administered by TTOR. Refuge staff time and resources are needed to ensure delineation of bird nesting and staging areas and seal haul-out areas (and otherwise closed areas) are accomplished on time, and sufficiently maintained to provide maximum protection for biological resources. Similarly, refuge staff presence will allow monitoring of biological resources and more timely reinstated access, when appropriate. The Service does not estimate additional costs associated with OSV or pedestrian use, as permitting infrastructure is already in place by TTOR, and TTOR staff provide regular presence at the Wauwinet Gatehouse and on Nantucket NWR.

ANTICIPATED IMPACTS OF THE USE:

Because this activity will be supervised by Service or partner staff, impacts of wildlife observation and photography will likely be minimal if conducted in accordance with refuge regulations. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. In the event of persistent disturbance to habitat or wildlife, the activity will be further restricted or discontinued. Participants in natural history tours conducted by partners may cause some disturbance to refuge visitors, but the amount of disturbance is expected to be minimal as the number of tours that will occur on the refuge will not exceed more than two a day, and do not occur on a daily basis.

There are impacts to refuge wildlife, vegetation, and soils from pedestrian and OSV access for visitors engaged in wildlife observation and photography. These are described below.

Pedestrian Travel Direct Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998). Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004/2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV

access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_coskata_coatue_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

☐ Use is not compatible.

☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Seasonal closures to the beach berm and intertidal area will be made to protect birds and seals. Visitors will be restricted to authorized trails, including the OSV trail and the proposed foot trail from the lighthouse to the beach.

Occasional law enforcement patrol and regular staff and partner presence should minimize potential violations. The refuge is open ½ hour before sunrise to ½ hour after sunset for wildlife observation and photography. These restrictions will be maintained. Refuge regulations will be posted and enforced.

Periodic evaluations will be done to insure that visitors are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an annual basis depending on geomorphology and wildlife use.

Special use permits are required for organizations conducting wildlife observation and photography activities on the refuge. A fee may be charged for the special use permit. The areas used by such tours will be closely monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity may be prohibited. Specific conditions may apply depending upon the requested activity and will be addressed through the special use permit.

Commercial photography is subject to a special use permit and commercial photographers will be charged a fee. The fee is dependent on size, scope, and impact of the proposed activity.

All photographers must follow refuge regulations. Photographers in closed areas must follow the conditions outlined in the special use permit which normally include notification of refuge personnel each time any activities occur in closed areas. Use of a closed area will be restricted appropriately to reduce disturbance to wildlife.

The refuge is a leave-no-trace, carry-in-carry out facility. All food containers, bottles, and other waste and refuse must be taken out. Littering, dumping, and abandoning property are prohibited by Federal regulation at 50 C.F.R. 27.93.94.

JUSTIFICATION:

The National Wildlife Refuge System Improvement Act of 1997 (P.L. 105-57) identifies six legitimate and appropriate uses of wildlife refuges: wildlife observation and wildlife photography, environmental education, interpretation, hunting, and fishing. These priority public uses are dependent upon healthy wildlife populations. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses in planning and management. Many visitors to Nantucket NWR engage in wildlife observation and photography.

We do not expect pedestrian access to materially interfere with or detract from the mission of the National Wildlife Refuge System, nor diminish the purpose for which the refuge was established. It will not pose significant adverse effects on refuge resources, nor interfere with public use of the refuge, nor cause an undue administrative burden. These uses facilitate wildlife observation and photography, and will provide compatible recreational opportunities for visitors to observe and learn about wildlife and habitats firsthand.

Over-sand vehicle use facilitates five priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Allowing controlled OSV access will facilitate visitation, fostering a greater awareness and appreciation of the importance of this site to the National Wildlife Refuge System. Occasional law enforcement patrol and regular Service and TTR presence should minimize potential violations of refuge regulations and closures, as previously described.

The vehicle limitations outlined in this determination provide maximum protection to prime nesting habitat for piping plovers and terns, as well as minimize disturbance to staging terns and resting seals. With proper monitoring, this use is not likely to materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that OSV use, at the discretion of the refuge manager, conducted as described including with stipulations, is sufficient.

Costs associated with administering these uses and likely visitor impacts are both minimal. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that wildlife observation and photography, at the discretion of the refuge manager, are compatible uses and contribute to the purposes for which Nantucket NWR was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/17/2012
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

9/11/2027

LITERATURE CITED:

Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.

- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Burger, J., and M. Gochfeld. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. *Environmental Conservation* 25:13-21.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.

- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConaughy, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125-202 in *Behavior of Marine Animals*. Vol. 6. Shorebirds: Migration and Foraging Behavior. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19-26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.

- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Îles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Augur, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S. Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

COMPATIBILITY DETERMINATION

USE:

Recreational Fishing

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

Recreational fishing on Nantucket NWR is saltwater surf fishing. Target species for anglers are striped bass, bluefish, and false albacore. Fishing may be done by individuals or small groups of friends and family members. In conjunction with refuge staff, special events such as fishing tournaments or "take me fishing" events may be held on the refuge.

The use is primarily facilitated by operation of over-sand vehicles, which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common.

TTOR requires OSV permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR) and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(b) Is it a priority public use?

Recreational fishing is a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(c) Where would the use be conducted?

Recreational fishing could occur on any stretch of beachfront on Nantucket NWR that is open to public access. Public access for fishing is dictated by wildlife use. In general, much of the intertidal area is open (at least to pedestrian traffic) for most of the year. Some areas of beach berm are closed seasonally to protect nesting shorebirds and seabirds and some intertidal areas are closed for resting seals. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures, visit the refuge Web site, or obtain information from The Trustees of Reservations (TTOR) at the Wauwinet Gatehouse.

Over-sand vehicle use is generally permitted on the beach berm from the high tide line to the base of the foredunes, as well as on established, officially designated OSV roads that bisect dunes in natural sand valleys. Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1) or in the wrack line, and are often prohibited from the very northern tip of the refuge to protect seals (Zone 3). Specific OSV traffic routes in other zones have varied annually and seasonally depending on wildlife use and public safety. For instance, Federal and State regulations require minimum buffer areas for various nesting species of shorebirds and seabirds. Depending on where birds nest and the shifting geomorphology of the dunes and intertidal habitat, it may be impossible to safely allow OSV access along a beach if the berm is narrow and the buffer required by nesting birds effectively extends below the high water line. Buffer distances may differ during the incubation period (when birds are tending to eggs and may require less area) and the chick rearing period (when some species are mobile foragers and may need a larger buffer of undisturbed habitat), resulting in changes in access within a season. Generally, Zone 4 will be closed to OSV access seasonally to protect nesting birds, and Zone 5 will be closed to OSV access seasonally to minimize disturbance to staging birds. However, locations of these closures may shift annually or within a season.

Additionally, sometimes nesting birds on Coskata-Coatue Wildlife Refuge (directly south of Nantucket NWR) will result in OSV closures and essentially limit OSV access to all northerly areas as well. Over-sand vehicle users will be informed at the Wauwinet Gatehouse of areas open to OSV travel, but because the location of nesting birds and changes in geomorphology cannot always be predicted, sudden changes in access may occur.

(d) When would the use be conducted?

Nantucket NWR is open to the public from ½ hour before sunrise to ½ hour after sunset. Surf fishing is permitted 24 hours a day. This is the only activity allowed at night on Nantucket NWR. Onsite fishing events would be held at times and on parts of the refuge that minimize impact to seals, terns, plovers, and other shorebirds and seabirds.

(e) How would the use be conducted?

Recreational fishing must be conducted in accordance with Federal and State regulations and refuge-specific policies, including seasonal closures and restrictions on over-sand vehicle (OSV) use. Over-sand vehicles are the most common means of access for fishermen using Nantucket NWR. Recreational fishermen may also fish from a boat on areas just offshore of Nantucket NWR. Refuge staff may partner with organizations such as the Nantucket Anglers Club to sponsor a fishing tournament, designed to introduce more people to the joys of fishing on the refuge.

Refuge visitors would primarily access the refuge by personal OSV, although some visitors engaged in fishing tours will access the refuge by four-wheeled drive vans operated by refuge partners. A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be

increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is the use being proposed?

Recreational fishing is identified as a priority public use in the National Wildlife Refuge System Improvement Act of 1997. Nantucket NWR is a premier destination for fishing and attracts visitors from all over the country. The refuge is located on the tip of Great Point, and is well known for the rip currents that make for excellent fishing. This area, though, also has a fairly consistent seal population which is drawn to the point because of the fish populations. Offering opportunities to fishermen at Nantucket NWR will increase visitor appreciation and awareness of the importance of this site to the National Wildlife Refuge System. Working with partners to hold fishing events will also increase the number of people participating in this priority public use on the refuge.

AVAILABILITY OF RESOURCES:

Recreational fishing is one of the primary reasons people visit the refuge. It occurs on the refuge with little involvement of refuge staff. Updated, friendly signage and current information is necessary to clarify refuge boundaries, seasonal closures, and permitted activities. The estimated costs of allowing this use is fairly small because there is little infrastructure involved and the presence of seasonal refuge and TTR staff increases voluntary compliance. Other than working with partners to plan and conduct special fishing events, the administration of this use is done collectively in conjunction with other uses.

Purchase new signage			\$5,000
Install new signage			\$1,000
Total Initial Cost of Program:			\$6,000
Maintain signage and Web site communication			\$1,000
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Seasonal staff presence	1 staff	200 hours	\$5,000
Fuel and Vehicle Costs			\$1,000
Total Annual Cost of Program:			\$9,000

ANTICIPATED IMPACTS OF THE USE:

Potential impacts of the use include erosion and soil compaction if access is by OSV, wildlife disturbance, and littering. Some disturbance of roosting and feeding shorebirds probably occurs (Burger 1981) but this will be minimized if closed areas are respected and OSV speed limits are obeyed. Discarded fishing line and other fishing litter can entangle migratory birds and marine mammals and cause injury and death (Gregory 1991). Litter also impacts the visual experience of visitors (Marion and Lime 1986). Conflicts with seals over fish have occurred in the past and seem to be becoming more frequent. Closures to reduce conflict between anglers and seals will be established and maintained. Information about seal behavior will be provided to anglers to reduce conflict and protect visitors who comply with refuge regulations. Several enforcement issues may result from the use, including trampling of vegetation following trespass into closed areas, illegal taking of fish (undersized, over limit), illegal fires, and disorderly conduct.

There are impacts to refuge wildlife, vegetation, and soils from pedestrian and OSV access for visitors engaged in fishing. These are described below.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site

(Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004/2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_corskata_coatue_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Areas that are open to this use (and to OSV, which is the primary means of access for recreational fishermen) will be evaluated on an annual, seasonal, and sometimes daily basis and will be influenced by beach geomorphology and wildlife use. Anglers will be expected to comply with these closures. Updates on closures will be disseminated at the Wauwinet Gatehouse and on the refuge Web site.

Occasional law enforcement patrol and regular staff and partner presence should minimize potential violations of refuge closures and curtail illegal fires, littering, and disorderly conduct. Periodic evaluations will be done to insure that activities associated with the use are not causing unacceptable adverse impacts to the natural resources. Unacceptable levels of violations or disturbance may result in eliminating or restricting public fishing. Occasional law enforcement patrols and regular refuge and TTOR presence should minimize potential violations of refuge closures and other regulations (speed limits, tire deflation requirements, prohibition of dogs). If persistent violations or disturbance to natural resources occur, OSV access will be eliminated.

Public meetings with local fishing clubs and interested parties will facilitate voluntary compliance of regulations. Recreational fishing events will be held only with the sponsorship of the Service and at times, in places, and with methods deemed to be in compliance with State and Federal wildlife regulations and other refuge regulations.

Continued permitting through TTOR at the Wauwinet Gatehouse will assist the dissemination of information about closures and other public use regulations on Nantucket NWR and also provide a means of tracking the number of annual OSV users.

Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds are sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds or seals. Areas where OSV use are allowed will be evaluated on an annual, seasonal, and sometimes daily basis and will be influenced by beach geomorphology as well as wildlife use. Updates on closures will be disseminated at the Wauwinet Gatehouse and on the refuge Web site.

The refuge is a leave-no-trace, carry-in-carry out facility. All food containers, bottles, and other waste and refuse must be taken out. Littering, dumping, and abandoning property are prohibited by Federal regulation at 50 C.F.R. 27.93.94.

JUSTIFICATION:

Recreational fishing is a priority public use identified in the National Wildlife Refuge System Improvement Act of 1997. Nantucket NWR is world renowned for its offshore fish resources and allowing this use will foster a greater awareness and appreciation of the importance of this site to the National Wildlife Refuge System. Costs associated with administering public fishing and likely visitor impacts are both minimal. This use will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that recreational fishing, at the discretion

of the refuge manager, is a compatible use and contributes to the purposes for which Nantucket NWR was established.

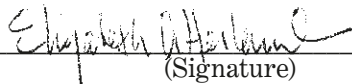
We do not expect pedestrian access to materially interfere with or detract from the mission of the National Wildlife Refuge System, nor diminish the purpose for which the refuge was established. It will not pose significant adverse effects on refuge resources, nor interfere with public use of the refuge, nor cause an undue administrative burden. These uses facilitate wildlife observation and photography, and will provide compatible recreational opportunities for visitors to observe and learn about wildlife and habitats firsthand.

Over-sand vehicle use facilitates five priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Allowing controlled OSV access will facilitate visitation, fostering a greater awareness and appreciation of the importance of this site to the National Wildlife Refuge System. Occasional law enforcement patrol and regular Service and TTOR presence should minimize potential violations of refuge regulations and closures, as previously described.

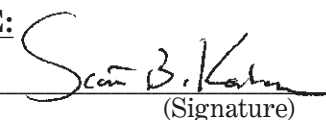
The vehicle limitations outlined in this determination provide maximum protection to prime nesting habitat for piping plovers and terns, as well as minimize disturbance to staging terns and resting seals. With proper monitoring, this use is not likely to materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that OSV use, at the discretion of the refuge manager, conducted as described including with stipulations, is sufficient.

Costs associated with administering fishing and resultant likely visitor impacts are minimal, although a staff person will be needed to deliver these programs to residents of Nantucket and refuge visitors. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that these uses, at the discretion of the refuge manager, are compatible uses and contribute to the purposes for which Nantucket NWR was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 15 YEAR RE-EVALUATION DATE:

9/11/2027

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.

- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.

- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Korschgen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on Comprehensive Conservation Plan - 215 - Appendix G: Final Compatibility Determinations a migrational staging area. *Wildlife Society Bulletin*. 13:290-296.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals*. Vol. 6. Shorebirds: Migration and Foraging Behavior. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.

- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthese des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuees aux Iles-de-la-Madeleine de 1987 a 1991. Association quebecoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Research Conducted by Non-Service Personnel

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate **Appropriate** ✓

Refuge Manager: *Elizabeth A. Herbert* Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: *Sharon E. Munn* Date: 8/12/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Research Conducted by Non-refuge Personnel

NARRATIVE:

The Service encourages and supports research and management studies on refuge lands that will improve and strengthen decisions on managing natural resources. The refuge manager encourages and seeks research that clearly relates to approved refuge objectives, improves habitat management, and promotes adaptive management. Priority research addresses information on better managing the Nation's biological resources that generally are important to agencies of the Department of Interior, the National Wildlife Refuge System, and State Fish and Game Agencies that address important management issues, or demonstrate techniques for managing species or habitats.

Researchers will submit a final report to the refuge on completing their work. For long-term studies, we may also require interim progress reports. We expect researchers to publish in peer-reviewed publications. All reports, presentations, posters, articles, or other publications will acknowledge the refuge system and the Nantucket NWR as partners in the research. All posters will adhere to Service graphics standards. We will insert this requirement to ensure that the research community, partners, and the public understand that the research could not have been conducted without the refuge having been established, its operational support, and that of the refuge system.

COMPATIBILITY DETERMINATION

USE:

Research Conducted by Non-Service Personnel

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

The use is the conduct of scientific research on the refuge by non-Service personnel.

(b) Is the proposed use a priority public use?

Research conducted by non-Service personnel is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

(c) Where will the use be conducted?

The location of the research will vary depending on the individual research project that is being conducted. The entire refuge is open and available for scientific research. An individual research project is usually limited to a particular habitat type, plant or wildlife species. On occasion research projects will encompass an assemblage of habitat types, plants, or wildlife, or may span more than one refuge or include lands outside the refuge. The research location will be limited to those areas of the refuge that are necessary to conduct the research project. Because of the need to close parts of the refuge spatially or temporally to protect refuge wildlife, some research may not be able to be conducted on the refuge.

(d) When will the use be conducted?

The timing of the research will depend entirely on the individual research project's approved design. Scientific research will be allowed to occur on the refuge throughout the year, unless it conflicts with the protection of seals, terns, plovers, and other shorebirds and seabirds of management priority. An individual research project

could be short-term in design, requiring one or two visits over the course of a few days. Other research projects could be multiple year studies that require daily visits to the study site. The timing of each individual research project will be limited to the minimum required to complete the project.

(e) How will the use be conducted?

The methods of the research will depend entirely on the individual research project that is conducted. The methods and study design of each research project will be reviewed and scrutinized before it will be allowed to occur on the refuge. No research project will be allowed if it does not have an approved scientific method, if it negatively affects endangered species, marine mammals, or migratory birds, or if it compromises public health and safety.

The use is primarily facilitated by pedestrian walking access or by operation of over-sand vehicles, which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common. Over-sand vehicles are also used by Service staff and TTOR when conducting biological surveys, roving interpretation, and natural and cultural history tours.

TTOR requires OSV permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR) and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(f) Why is this use being proposed?

Research by non-Service personnel is conducted by colleges, universities, Federal, State, local agencies, non-governmental organizations, and qualified members of the public to further the understanding of the natural environment and to improve the management of the refuge's natural resources. Much of the information generated by the research is applicable to management on and near the refuge.

The Service will encourage and support research and management studies on refuge lands that will improve and strengthen natural resource management decisions. The refuge manager will encourage and seek research relative to approved refuge objectives that clearly improves land management and promotes adaptive management. Priority research addresses information that is important to agencies of the Department of Interior, the U.S. Fish and Wildlife Service, the National Wildlife Refuge System, State Fish and Game agencies and other agencies that are responsible for managing natural resources.

The refuge will also consider research for other purposes that may not be directly related to refuge-specific objectives, but contribute to the broader enhancement, protection, use, preservation, and management of native populations of fish, wildlife, and plants, and their natural diversity within the region or flyway. These proposals must comply with the Service's governing laws, regulations, and policies.

The refuge will maintain a list of research needs that will be provided to prospective researchers or organizations upon request. Refuge support of research directly related to refuge objectives may take the form of funding, in-kind services such as housing or use of other facilities, direct staff assistance with the project in the form of data collection, provision of historical records, conducting management treatments, or other assistance as appropriate.

AVAILABILITY OF RESOURCES:

The bulk of the cost for research is incurred in staff time to review research proposals, coordinate with researchers and write Special Use Permits. In some cases, a research project may only require one day of staff time to write a Special Use Permit. In other cases, a research project may take an accumulation of weeks, as the refuge biologist must coordinate with students and advisors and accompany researchers on site visits.

Annual costs associated with the administration of outside research on the refuge are estimated below:

Research program administration	1 staff	40 hours	\$2,000
Total Annual Cost of Program:			\$2,000

ANTICIPATED IMPACTS OF THE USE:

The Service encourages approved research to further the understanding of the natural resources. Research by other than Service personnel adds greatly to the information base for refuge managers to make proper decisions. Disturbance to wildlife and vegetation by researchers could occur through observation, mist-netting, banding, and accessing the study area by foot, boat, or vehicle. These impacts could be exacerbated by multiple concurrent research projects. It is possible that direct mortality could result as a by-product of research activities. Mist-netting, for example, can cause stress, especially when birds are captured, banded, and weighed. There have been occasional mortalities to these birds, namely when predators such as raccoons and cats reach the netted birds before researchers do.

Minimal impact will occur when research projects that are previously approved are carried out according to the stipulations stated in the Special Use Permit issued for each project. Overall, however, allowing well designed and properly reviewed research to be conducted by non-Service personnel is likely to have very little impact on refuge wildlife populations. If the research project is conducted with professionalism and integrity, potential adverse impacts are likely to be outweighed by the knowledge gained about an entire species, habitat, or public use.

Because this activity will be supervised by Service or partner staff, impacts of research will likely be minimal if conducted in accordance with refuge regulations. In the event of persistent disturbance to habitat or wildlife, the activity will be further restricted or discontinued.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders

and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004, 2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_corskata_coastue_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

All researchers will be required to submit a detailed research proposal following Service Policy (FWS Refuge Manual Chapter 4 Section 6). The refuge must be given at least 45 days to review and decide whether to approve proposals before initiation of research. If collection of wildlife is involved, the refuge must be given 60 days to review and decide whether to approve the proposal. The Service cannot guarantee that it will review or approve proposals not submitted within these timeframes. Proposals will be prioritized and approved based on need, benefit, compatibility, and funding required.

Special Use Permits (SUP) will be issued for all research conducted by non-Service personnel. The SUP will list all conditions that are necessary to ensure compatibility. The Special Use Permits will also identify a schedule for periodic progress reports and the submittal of a final report or scientific paper. The regional refuge biologists, other Service Divisions, and State agencies will be asked to review and comment on proposals.

All researchers will be required to obtain appropriate State and Federal permits.

Any research project may be terminated at any time for non-compliance with the conditions of the SUP, or modified, redesigned, relocated, or terminated upon determination by the refuge manager that the project is causing unanticipated adverse impacts to wildlife, wildlife habitat, approved priority public uses, or other refuge management activities.

All work with endangered species will require the proper permits from Federal or State government.

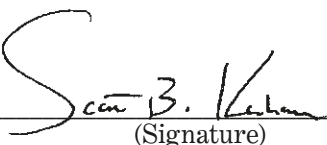
JUSTIFICATION:

The Service encourages approved research to further understanding of refuge natural resources. Research by non-Service personnel, guided by the stipulations listed above, adds greatly to the information base for refuge managers to make proper decisions. This use will potentially contribute to the refuge's purpose in carrying out migratory bird management. While some research activities may cause minimal disturbance to wildlife or result in the loss of specific individuals, this impact will be more than offset by the value of the research to managers and future generations. Research conducted by non-Service personnel will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.

- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.

- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Iles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Commercial Guides, Tours, and Outfitting

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ☐ **Appropriate** ☒

Refuge Manager: Elyse A. Heiland Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Michael J. Mauri Date: 8/12/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Commercial Guides, Tours, and Outfitting

NARRATIVE

Service policy allows appropriate commercial uses of a refuge if they are a refuge management economic activity (see 50 CFR 25.12), if they directly support a priority general public use, or if they are specifically authorized by statute (50 CFR 29.1). Commercial guides and guided tours are not a priority public use themselves, but help facilitate wildlife observation, photography, fishing, and interpretation, which are four of the six public uses given priority by the Refuge System Improvement Act of 1997.

The Trustees of Reservations (TTOR), a non-profit conservation organization, have been operating natural history, cultural history, and fishing tours from their adjacent property in partnership with the refuge for many years. As part of a long-standing partnership, TTOR provides wildlife and habitat management assistance to the refuge, including establishing beach closures for seals and piping plovers. Their staff presence on the refuge has resulted in greater awareness and understanding of refuge policies and compliance with those policies. The Trustees of Reservation's commercial use of the refuge has been beneficial to the refuge's management goals and has also enhanced the refuge's ability to provide opportunities for quality, wildlife-dependent recreation to visitors. In the future, TTOR, other conservation organizations, concessionaires, and/or permittees could provide guided tours of the refuge, including the access to the refuge through the lands of Nantucket Conservation Foundation and TTOR or by boat. Commercial guides, concessionaires or permittees providing fishing or photography lessons and guidance would also support the public's use of the refuge for wildlife-dependent public use. All commercial guides and all organizations providing tours to the public must first obtain a Special Use Permit from the refuge manager or be selected by the refuge manager as a concessionaire. All activities will be monitored for potential impacts to wildlife and habitat and adjustments made as necessary.

COMPATIBILITY DETERMINATION

USE:

Commercial Guides, Tours, and Outfitting

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

The use is formal, guided natural history or cultural history tours on refuge lands that are conducted by a conservation partner, concessionaire, or private company for profit. It also includes commercial guiding and outfitting, primarily for but not limited to fishing, and also conducted for profit, where the expertise of the leader enhances the experience of the individual or party. In all cases, the participants pay a fee to participate in the individual guide or to the company/organization leading the tour.

The use is primarily facilitated by operation of over-sand vehicles, which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common. Over-sand vehicles are also used by Service staff and TTOR when conducting biological surveys, roving interpretation, and natural and cultural history tours.

TTOR requires OSV permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR) and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(b) Is the use a priority public use?

Commercially guided tours are not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). While the use is not a priority use, it does support several wildlife-dependent priority uses, particularly fishing, wildlife observation, interpretation, and photography.

(c) Where would the use be conducted?

Guided tours and outfitting could occur on any areas of the refuge that are open to public access. Public access is dictated by wildlife use and presence of sensitive vegetation. In general, much of the intertidal area and established vehicle trails through the dune system are open (at least to pedestrian traffic) for much of the year. Some areas of beach berm are closed seasonally to protect seals, nesting shorebirds, and seabirds. Public access is restricted from dune habitat to minimize trampling of American beach grass (*Ammophila breviligulata*), although the refuge plans to establish an authorized trail from the lighthouse to the beach on the Atlantic Ocean. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures. Information about closures will also be available on the refuge Web site or through TTOR, who operates the gatehouse at the entrance to the Coskata-Coatue Peninsula and through whose property all refuge visitors must pass if traveling to the refuge by over-sand vehicle or on foot.

Over-sand vehicle use is generally permitted on the beach berm from the high tide line to the base of the foredunes, as well as on established, officially designated OSV roads that bisect dunes in natural sand valleys. Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1) or in the wrack line, and are often prohibited from the very northern tip of the refuge to protect seals (Zone 3). Specific OSV traffic routes in other zones have varied annually and seasonally depending on wildlife use and public safety. For instance, Federal and State regulations require minimum buffer areas for various nesting species of shorebirds and seabirds. Depending on where birds nest and the shifting geomorphology of the dunes and intertidal habitat, it may be impossible to safely allow OSV access along a beach if the berm is narrow and the buffer required by nesting birds effectively extends below the high water line. Buffer distances may differ during the incubation period (when birds are tending to eggs and may require less area) and the chick rearing period (when some species are mobile foragers and may need a larger buffer of undisturbed habitat), resulting in changes in access within a season. Generally, Zone 4 will be closed to OSV access seasonally to protect nesting birds, and Zone 5 will be closed to OSV access seasonally to minimize disturbance to staging birds. However, locations of these closures may shift annually or within a season.

Additionally, sometimes nesting birds on Coskata-Coatue Wildlife Refuge (directly south of Nantucket NWR) will result in OSV closures and essentially limit OSV access to all northerly areas as well. Over-sand vehicle users will be informed at the Wauwinet Gatehouse of areas open to OSV travel, but because the location of nesting birds and changes in geomorphology cannot always be predicted, sudden changes in access may occur.

(d) When would the use be conducted?

The refuge is open to approved commercial guiding, touring, and outfitting from ½ hour before sunrise to ½ hour after sunset. The refuge is open to surf fishing 24 hours a day. The majority of the guided tours would take place from Memorial Day to Labor Day. Commercial fishing guides and outfitters would most likely be assisting anglers April through October. The Service may limit the number of daily tours and/or guided visits to ensure a high quality experience is achieved by refuge visitors.

(e) How would the use be conducted?

This use can be conducted in a number of ways. Guided tours consist of a group of people with a leader or guide walking on established trails learning about plant and wildlife species, natural processes and wetlands, and/or cultural history. TTOR currently conducts interpretation on Nantucket NWR through seasonal natural and cultural history guided tours. They also conduct tours of the Great Point Lighthouse, which is an inholding on the refuge. They have also conducted fishing tours, which are designed in part to teach people how to fish. Guiding can also be conducted by commercial guides and outfitters who provide intensive, individual guidance

to refuge visitors. The primary type of guiding/outfitting would be saltwater fishing, as the refuge is a well-known recreational fishing location. Commercial guides could also be used by individuals to enhance individual experiences for other priority public uses, including photography or bird watching. In all cases, these guides are paid a fee for their professional expertise, and they transport their customers to the refuge in an over-sand vehicle or by boat or kayak. Tours which are not currently being conducted but which could in the future would include seal tours and kayaking/boat tours. All these guides and tour operators will be required to obtain a Special Use Permit, comply with refuge regulations and comply with State and Federal guidelines for terns and piping plover protection.

Refuge visitors of such tours would primarily access the refuge by four-wheeled drive vans operated by refuge partners or those granted a special use permit. All OSV users must have a TTOR permit (required for passage through the Wauwinet Gatehouse). While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is this use being proposed?

Access to the refuge is limited to individuals who have over-sand vehicles and obtain either a daily or annual permit from TTOR through whose property (as well as that of the Nantucket Conservation Foundation), all visitors must pass. The tours and individual guided sessions will increase understanding and appreciation of the refuge, its resources, and will increase compliance with refuge regulations.

AVAILABILITY OF RESOURCES:

Administer SUPs and provide oversight	1 staff	150 hours	\$6,000
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Fuel and Vehicle Costs			\$1,000
Total Annual Cost of Program:			\$9,000

ANTICIPATED IMPACTS OF THE USE:

The proposed use is anticipated to have the same level of impacts than those under the primary public uses, because the access and activities are very similar. Because this activity will be supervised by Service or partner staff, impacts of tours will likely be minimal if conducted in accordance with refuge regulations. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. In the event of persistent disturbance to habitat or wildlife, the activity will be further restricted or discontinued. Schoolchildren or participants in natural history tours conducted by partners may cause some disturbance to refuge visitors, but the amount of disturbance is expected to be minimal as the number of tours that will occur on the refuge will not exceed more than two a day, and do not occur on a daily basis.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was reference from this document:

Several studies have examined the effects of recreation on birds using shallow-water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004/2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmert 1992, Myers et al. 1987, Sennler & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds.

Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_cuskata_coast_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Periodic evaluations will be done to insure that visitors and programs are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an ongoing basis to ensure visitor safety, compliance with State and Federal tern and plover guidelines, and to minimize impacts on vegetation and wildlife.

Special use permits are required for organizations, outfitters, and individual guides conducting tour activities on Nantucket NWR. A fee may be charged for the special use permit. The areas used by such guides, outfitters, and tours will be monitored to evaluate the impacts on the resource; if adverse impacts appear, the activity may be prohibited. Specific conditions may apply depending upon the requested activity and will be addressed through the special use permit. Regulations to ensure the safety of all participants will also be included. The total number of interpretative tours (conducted by non-profit and/or commercial tour guides) that will occur on the refuge will not exceed more than two a day, and will not occur on a daily basis.

Continued permitting through TTOR at the Wauwinet Gatehouse will assist the dissemination of information about closures and other public use regulations on Nantucket NWR and also provide a means of tracking the number of annual OSV users.

Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds are sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds or seals. Areas where OSV use are allowed will be evaluated on an annual, seasonal, and sometimes daily basis and will be influenced by beach geomorphology as well as wildlife use. Updates on closures will be disseminated at the Wauwinet Gatehouse and on the refuge Web site.

Occasional law enforcement patrols and regular refuge and TTOR presence should minimize potential violations of refuge closures and other regulations (speed limits, tire deflation requirements, prohibition of dogs). If persistent violations or disturbance to natural resources occur, OSV access will be eliminated.

The refuge is a leave-no-trace, carry-in-carry out facility. All food containers, bottles, and other waste and refuse must be taken out. Littering, dumping, and abandoning property are prohibited by Federal regulation at 50 C.F.R. 27.93.94.

All guides and tours will be familiar with State and Federal tern and plover guidelines and will comply with such guidelines on the refuge. Any changes to the schedule which are proposed or requested need to be communicated to the refuge manager. The known presence of an endangered species will preclude the use of an area until the refuge manager determines otherwise.

The refuge manager will be provided a log at the end of each season, or upon request, that shows the number of participants in tours or the number of individual guided customers on a daily basis.

JUSTIFICATION:

Natural and cultural history activities generally support refuge purposes and impacts can largely be minimized. The minor resource impacts attributed to these activities are generally outweighed by the benefits gained by educating present and future generations about refuge resources. Guided natural history tours are a public use management tool used to develop a resource protection ethic within society. This tool allows us to educate refuge visitors about endangered and threatened species management, wildlife management and ecological principles and communities. A secondary benefit of this use is that it instills an 'ownership' or 'stewardship' mentality in visitors and most likely reduces vandalism, littering, and poaching; it also strengthens Service visibility in the local community. Cultural history activities allow visitors to both learn about the artifacts left in an area but also hopefully gain an appreciation for the refuge purpose and lands on which these activities take place.

The issuance of SUPs for commercial guiding/outfitting does not significantly impact biological resources for which the refuge was established and requires no additional facilities. The administrative requirement is minimal. In fact, this activity has a positive effect on the overall interpretive, environmental education, and wildlife observation programs of the refuge, facilitating the message to reach a much larger audience. This use would contribute to the mission of the refuge by increasing the audience that receives the message of the USFWS, producing a greater appreciation of wildlife resources in participants, and building relationships between the refuge and area businesses.

We do not expect pedestrian access to materially interfere with or detract from the mission of the National Wildlife Refuge System, nor diminish the purpose for which the refuge was established. It will not pose significant adverse effects on refuge resources, nor interfere with public use of the refuge, nor cause an undue administrative burden. These uses facilitate wildlife observation and photography, and will provide compatible recreational opportunities for visitors to observe and learn about wildlife and habitats firsthand.

OSV use facilitates five priority public uses identified in the National Wildlife Refuge System Improvement Act of 1997. Allowing controlled OSV access will facilitate visitation, fostering a greater awareness and appreciation of the importance of this site to the National Wildlife Refuge System. Occasional law enforcement patrol and regular Service and TTOR presence should minimize potential violations of refuge regulations and closures, as previously described.

The vehicle limitations outlined in this determination provide maximum protection to prime nesting habitat for piping plovers and terns, as well as minimize disturbance to staging terns and resting seals. With proper

monitoring, this use is not likely to materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that OSV use, at the discretion of the refuge manager, conducted as described including with stipulations, is sufficient.

Costs associated with administering these uses and likely visitor impacts are both minimal. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket National Wildlife Refuge. Therefore, it is the determination of the Service that commercially guided tours, at the discretion of the refuge manager, are compatible uses and contribute to the purposes for which the refuge was established.

SIGNATURE:

Refuge Manager: Elizabeth A. Haines 7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief: Scott B. Kahn 9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

9/11/2022

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.

- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Burger, J., and M. Gochfeld. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. *Environmental Conservation* 25:13-21.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.

- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Iles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.

- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Saunders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Outdoor Events and Ceremonies

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes _____ No ✓

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate _____ **Appropriate** ✓

Refuge Manager: Christopher A. Heald Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Sharon F. Manna Date: 8/12/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Outdoor Events and Ceremonies

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Outdoor events and ceremonies are group gatherings conducted by non-Service individuals or organizations. These uses are not outlined in an approved plan; however, there may be instances in which they can be conducted in a time, place, and manner which does not conflict with refuge goals and objectives. Although this use is not typically undertaken to promote or benefit refuge natural or cultural resources, it can expose the public to the refuge and provide an opportunity for appreciation of the refuge’s natural and cultural resources. Fundraising events are not allowed unless the U.S. Fish and Wildlife Service receives 100 percent of the funds raised by the event. Additionally, events that are conducted where people are receiving an appearance fee or prize of more than nominal value will not be allowed. Organizers may charge a slight fee to recoup the cost of the event, but may not make a profit on the event.

Each event has different logistics, and therefore each would be evaluated for impacts on the refuge mission. A Special Use Permit must be issued with appropriate stipulations, including limitations on the number of people attending, parking restriction, etc. Events and ceremonies found to be detrimental to the refuge mission will not be allowed. A fee will be charged for each permit. Stipulations will be developed to ensure that events do not create an unacceptable impact on wildlife or cultural resources, do not disrupt visitors engaged in priority wildlife-dependent public uses, do not unreasonably disrupt the atmosphere of peace and tranquility, or create an unsafe or unhealthy environment for visitors or employees. Events may not be held in areas closed to the public to protect wildlife, and events may not be held that result in the closure of an area that would otherwise be open to the public.

COMPATIBILITY DETERMINATION

USE:

Outdoor Events and Ceremonies

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [16 U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "...particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(k) What is the use?

The use is outdoor events and ceremonies are group gatherings conducted by non-Service individuals or organizations. Fundraising is only allowed when 100 percent of the proceeds are given to the U.S. Fish and Wildlife Service.

Access to Nantucket NWR for these activities can be achieved by boat, over-sand vehicle (OSV), or foot. The use is primarily facilitated by operation of OSVs, which consists of driving 4-wheeled drive vehicles on designated areas of the Refuge beach and inland sand roads. OSV use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by The Trustees of Reservations (TTOR) and walk to the Refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common.

TTOR administers additional permits and regulates passage through the Wauwinet Road Gatehouse which provides the only OSV access to Nantucket NWR, Coskata-Coatue Wildlife Refuge (owned by TTOR), and Coatue Wildlife Refuge (owned by Nantucket Conservation Foundation).

(a) Is the use a priority public use?

Outdoor events and ceremonies are not considered priority public uses of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997.

(b) Where would the use be conducted?

Outdoor events and ceremonies will be allowed in any area open to the public under terms specified in a Special Use Permit. The refuge is divided into 5 zones, which indicate pedestrian and vehicular open and closed areas based on time of year and/or the presence of wildlife. The tip of the refuge (Zone 3) is generally closed for seals and Zone 2 is generally open to both pedestrians and vehicles. The use will not be allowed in environmentally sensitive areas such as the dunes and in any area managed for habitat conservation or wildlife protection.

OSV use is generally permitted on the beach berm from the high tide line to the base of the foredunes, as well as on established, officially designated OSV roads that bisect dunes in natural sand valleys. OSV users are not allowed to drive on dune habitat (Zone 1) or in the wrack line, and are often prohibited from the very northern tip of the refuge to protect seals (Zone 3). Specific OSV traffic routes in other Zones have varied annually and seasonally depending on wildlife use and public safety. For instance, Federal and State regulations require minimum buffer areas for various nesting species of shorebirds and seabirds. Depending on where birds nest and the shifting geomorphology of the dunes and intertidal habitat, it may be impossible to safely allow OSV access along a beach if the berm is narrow and the buffer required by nesting birds effectively extends below the high water line. Buffer distances may differ during the incubation period (When birds are tending to eggs and may require less area) and the chick rearing period (when some species are mobile foragers and may need a larger buffer of undisturbed habitat), resulting in changes in access within a season. Generally, Zone 4 will be closed to OSV access seasonally to protect nesting birds, and Zone 5 will be closed to OSV access seasonally to minimize disturbance to staging birds. However, locations of these closures may shift annually or within a season.

(c) When would the use be conducted?

Nantucket NWR is open to approved outdoor events and ceremonies from ½ hour before sunrise to ½ hour after sunset. Outdoor events and ceremonies could occur any time of the year in any areas open to public access. Use of the refuge for these activities is likely to be highest in late spring, summer, and early fall.

(d) How would the use be conducted?

Permission to hold an outdoor event or ceremony must be requested in writing by the organizer a minimum of 60 days in advance of the event. Each request must be submitted to the refuge manager at the Eastern Massachusetts NWR Complex headquarters in Sudbury, Massachusetts. The request must provide details of who, what, where, when, why, and how the event will be conducted. The request must indicate how people will travel to the refuge (foot, boat, or OSV). Each request has different logistics, and therefore will be evaluated for impacts on the refuge mission. Using professional judgment, as long as there is no significant negative impact to natural resources or visitor services, nor violation of refuge regulations, a Special Use Permit will be issued outlining the framework in which the event or ceremony can be conducted. A fee will be required to pay for staff time and travel expenses necessary to monitor the event and ensure compliance with Special Use Permit stipulations.

All visitors who access the refuge by OSV must have an OSV permit from TTOR, required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tideline to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). OSV users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 psi before passing through the Wauwinet Gatehouse, and speed restrictions are well posted. Events requiring OSV access to the refuge will not be held when seasonal access is prohibited on TTOR or NCF land due to the presence of piping plovers, making vehicular access to the refuge impossible.

All OSV drivers will receive information on annual, seasonal, and daily closures as well as a guide to safe OSV use at the Wauwinet Gatehouse. All OSV users are expected to stay apprised of and respect all closures and regulations. Refuge staff will carefully monitor OSV use to ensure Zone buffers and boundaries are sufficient to prevent disturbance to nesting and staging birds and seals. Closure areas may be increased if OSV access along the zone boundaries disrupts birds.

(e) Why is the use being proposed?

Nantucket NWR staff receive occasional requests to conduct outdoor events or ceremonies and other events have occurred on the refuge for several years without notification by the organizers or permission from refuge staff. While the number of events is low, and the number of future requests we anticipate to receive is low, we want to be able to review the request and issue a Special Use Permit if we determine that we can regulate the

event so that it has minimal impact to refuge resources and visitors. Although outdoor events and ceremonies may not directly contribute to the achievement of the refuge purposes or the National Wildlife Refuge System mission, such events can contribute to the public's understanding and appreciation of the refuge's natural resources.

AVAILABILITY OF RESOURCES:

Permitting this use is generally within the resources of the existing staff. Staff costs are incurred to review each request, coordinate with the permittee and with abutting neighbors (NCF and TTOR for access), and process the Special Use Permit. Monitoring the Special Use Permit to ensure compliance with its conditions will be conducted by seasonal staff (if available) or our refuge law enforcement officers. Nantucket NWR has been seasonally staffed during the summer for 2 years, but future staffing is dependent upon future budgets. Law enforcement staff from the refuge will need to be reimbursed for travel expenses and time to ensure compliance.

Total Initial Cost of Program:			\$0
Review request, coordination, and process SUP	2 staff	20 hours	\$2,000
Biological on-site staff	1 staff	20 hours	\$1,000
Law enforcement presence	1 staff	40 hours	\$2,000
Travel costs			\$2,000
Total Annual Cost of Program:			\$7,000*

**Travel costs would be reimbursed by permittee; assumes 3 events annually.*

Refuge staff time and resources are needed to ensure that delineation of bird nesting and staging areas and seal haul-out areas (and otherwise closed areas) is accomplished on time, and sufficiently maintained to provide maximum protection for biological resources. Refuge law enforcement will be needed to ensure permit compliance. The Service does not estimate additional costs associated with OSV or pedestrian use, as permitting infrastructure is already in place by TTOR, and TTOR staff provide regular presence at the Wauwinet Gatehouse and on Nantucket NWR.

ANTICIPATED IMPACTS OF PROPOSED ACTIONS:

Impacts to refuge resources will be minimal if conducted in accordance with refuge regulations and conditions contained within the Special Use Permit. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. The amount of disturbance is expected to be minimal as events will be structured to be held only in areas open to the public, to be occasional and short term in nature, and to be conducted in a manner which does not interfere with other visitors' enjoyment of the refuge or natural environment. If significant negative impacts from this use cannot be avoided, a Special Use Permit will not be issued.

There are impacts to refuge wildlife, vegetation, and soils from pedestrian and OSV access for visitors engaged in environmental education and/or interpretation. These are described below.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was reference from this document:

Several studies have examined the effects of recreation on birds using shallow- water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge

closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback *et al.* (2004/2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback *et al.* also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. OSV use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher *et al.* 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

OSV use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson *et al.* 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity

caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, MA. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, MA show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (suborder Charadrii) that breed in North America migrate up to 30,000 km annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, MA, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, MA found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). ORV use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. TTOR has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_cuskata_coastue_wildlife_refuge.cfm.

PUBLIC REVIEW AND COMMENTS:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS TO INSURE COMPATIBILITY:

Special use permits are required for organizations wishing to hold an outdoor event or ceremony or individuals wishing to hold a ceremony on the refuge.

The refuge manager must receive a written application for a Special Use Permit no later than 60 days before the event. The written request must provide clear and concise information about the nature of the event (who, what, where, when, why, and how), including the estimated number of attendees. The refuge manager will not consider incomplete requests that do not provide full details of the event.

Each application will be evaluated for impacts to the refuge, its wildlife and visitors. Refuge staff will use professional judgment to ascertain the proposed impacts of the event. As long as there are minimal impacts to refuge resources and visitors, a Special Use Permit will be issued outlining the framework in which this use can be conducted. The refuge manager may impose a limitation on the number of attendees allowed per event if disturbance to refuge resources or other visitors indicates that such a limitation is necessary to ensure compatibility.

The Service may recover from the permittee all agency costs incurred in processing the application for a Special Use Permit, and monitoring the permitted activity if the request is approved. Costs associated with processing the application may be required even if the request is subsequently denied. A fee may be charged for the special use permit, particularly if the permittee is not a conservation partner and there is a need for law enforcement presence to ensure compliance with refuge regulations and permit conditions.

Events may only take place while the refuge is open, which is one-half hour before sunrise to one-half hour after sunset. Activities may only take place in areas open to the public, and refuge regulations will be posted and enforced. Beach sports, kites, and dogs are not allowed at any time. Additional restrictions may be imposed by the refuge manager.

The refuge manager will make the final decision about where, when and how events may be held on the refuge.

If access to the refuge is via OSV, all event attendees will obtain permits from the TTOR to cross TTOR and NCF land.

The permittee will comply with all pedestrian and vehicle closures on the refuge and partner conservation land (NCF and TTOR). This may result in the inability of a scheduled event to be held due to closures for pedestrians and/or vehicles.

The number of attendees may be limited by the refuge manager, as may the number of OSVs that are permitted on the refuge. There is no formal parking area on the refuge, and permittees may not conduct events that prevent, even inadvertently, authorized public access for priority, wildlife-dependent public use.

Events may be catered, with tables, tents, and chairs. Tents must be set up in an area that avoids disturbance of refuge resources and visitors. All tents must be set up and taken down the same day as the event and within regular hours that the refuge is open to the public. Permittees must ensure that all excess food is removed from the refuge and not made available for consumption by wildlife.

Alcohol may be served outdoors. Permittees shall ensure that event and ceremony attendees are not inebriated on the refuge and comply with all applicable Department of Interior and Service policies.

There shall be no electric amplification of musical instruments or voices during any ceremonies or events.

All trash must be removed from site by the end of each day and properly disposed of. The site must be left clean and in an unimpaired manner.

Permittees must provide portable toilets for the event to be used by attendees. The portable toilets must be delivered no earlier than 24 hours before the event and must be removed no later than 24 hours after the event. The permittee will be responsible for any cleanup associated with the use of portable toilets, even if caused by vandalism caused by a refuge visitor who was not an attendee at the permitted event.

In most cases, permittees will be required to carry Commercial General Liability Insurance. Depending on the event, the refuge manager may require additional coverage such as proof of automobile liability insurance or special coverage if alcohol is served.

All permittees must provide its attendees with information about the refuge, our mission and purpose. Permittees are responsible for the compliance of refuge regulations by attendees.

No permittee may create a safe or unhealthy environment for other visitors or employees.

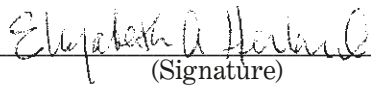
No event may result in the closure of an area normally open to the public.

Failure to comply with refuge regulations or Special Use Permit conditions will result in a denial of Special Use Permits by the permittee for future events.

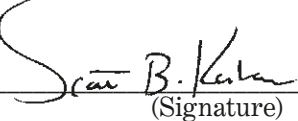
JUSTIFICATION:

Special outdoor events or ceremonies may not directly contribute to the achievement of the refuge purposes or the National Wildlife Refuge System mission, but can contribute to the public's understanding and appreciation of the refuge's natural resources. Therefore, a group event is compatible as long as it is conducted safely and does not conflict with a priority public use, within the confines of open public use areas. It is deemed this activity will not materially interfere with or detract from the mission of the NWRS or purposes for which Nantucket NWR was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

9/11/2022

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.

- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125-202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19-26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.

- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Îles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Non-Motorized Boat Landing and Launching

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

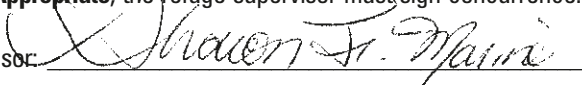
Not Appropriate **Appropriate** ✓

Refuge Manager:  Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor:  Date: 8/17/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Non-Motorized Boat Landing and Launching

NARRATIVE

The Refuge System Improvement Act of 1997 instructs refuge managers to seek ways to accommodate the six priority public uses of the National Wildlife Refuge System. Although non-motorized boating is not a priority public use, it facilitates participation in priority wildlife-dependent recreation, including the five priority public uses which occur on Nantucket National Wildlife Refuge. Non-motorized boating will provide opportunities for fishing, wildlife observation, photography, environmental education, and interpretation. Boating will be restricted to smaller, non-motorized vessels to avoid impacts to wildlife and habitat. It is unlikely that many people will travel to the refuge to launch non-motorized boats. Boat landings from kayakers who launch from other sites on Nantucket Island will occur. Given the distance of the refuge on the Coskata-Coatue Peninsula from suitable launch sites on Nantucket Island, the amount of non-motorized boat traffic is expected to be fairly low. All boat use, including landings and distance from shore that needs to be maintained to minimize disturbance to wildlife, will be subject to all Federal and State regulations and seasonal closures for nesting shorebirds and seals.

COMPATIBILITY DETERMINATION

USE:

Non-Motorized Boat Landing and Launching

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [16 U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

The use is the landing and launching of non-motorized boats on the refuge beach. The majority of the boats will be kayaks.

(b) Is the use a priority public use?

The use is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). However, it does facilitate the priority public uses of wildlife observation, wildlife photography, environmental education, interpretation, and fishing.

(c) Where would the use be conducted?

Non-motorized boat access is allowed on any part of the refuge beach that is open to the public. Public access is dictated by wildlife use. In general, much of the intertidal area is open (at least to pedestrian traffic) for most of the year. Some areas of beach berm are closed seasonally to protect nesting shorebirds and seabirds and some intertidal areas are closed for resting seals. Public access is currently restricted from dune habitat to minimize trampling of American beach grass (*Ammophila breviligulata*) although refuge staff plan to establish an authorized, permanent path from the lighthouse to the beach on the Atlantic Ocean. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures, visit the refuge Web site, or contact our conservation partner on the refuge, The Trustees of Reservations (TTOR).

(d) When would the use be conducted?

Nantucket NWR is open to the public from ½ hour before sunrise to ½ hour after sunset. Surf fishing is permitted 24 hours a day. This is the only activity allowed on the refuge at night. Over-sand vehicle (OSV) access is permitted year round, except for potential seasonal closures due to wildlife use and/or public safety concerns. While visitors could launch a non-motorized boat from the refuge, most of this use will be from people paddling or rowing to the refuge from other places on Nantucket Island.

(e) How would the use be conducted?

Non-motorized boating, such as kayaks, will be allowed as a means to facilitate refuge public use programs, namely the priority public use programs of fishing, wildlife observation and photography, and environmental education and interpretation. The use would be conducted consistent with refuge and Massachusetts regulations, with some additional restrictions to protect fish, wildlife, and habitat. Visitors can launch non-motorized boats from cars in areas where the beach is open to OSVs. Additional opportunities to launch non-motorized boats exist on nearby non-refuge lands.

A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). OSV users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

The refuge does not provide boat trailer access. The refuge does not have the infrastructure to support large, trailered, motorized boats. In addition, these vessels have greater tendencies to erode sensitive marsh shoreline with their wakes, disturb nesting birds, and re-suspend bottom sediments. These effects reduce water quality and submerged aquatic vegetation production, which is contrary to refuge goals and objectives. Also, large, recreational motorboats can diminish quality, wildlife-dependent experiences due to the noise disturbance.

(f) Why is the use being proposed?

Fishing, wildlife observation and photography, and environmental education and interpretation are five of the six priority public uses of the Refuge System. Where these uses are determined to be compatible, they are to receive enhanced consideration over other uses. Non-motorized boating is allowed as a means to facilitate these priority public uses. By allowing this use, we are providing opportunities and facilitating refuge programs in a manner and location that offer high quality, wildlife-dependent recreation and maintain the level of current fish and wildlife values.

AVAILABILITY OF RESOURCES:

No additional resources are needed to facilitate non-motorized boat landing and launching. The estimated costs of allowing these uses is minimal because there is little infrastructure involved and administration of these uses is done collectively in conjunction with other uses. These costs include all beach use activities, including walking and beachcombing. The costs associated with signage, law enforcement, and seasonal staff presence are common to all these uses.

Purchase new signage			\$5,000
Install new signage	2 staff	24 hours each	\$1,000
Total Initial Cost of Program:			\$6,000

Maintain signage	1 staff	24 hours	\$1,000
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Seasonal staff presence	1 staff	200 hours	\$5,000
Fuel and Vehicle Costs			\$1,000
Total Annual Cost of Program:			\$9,000

ANTICIPATED IMPACTS OF THE USE:

Access to the refuge beach for the purpose of launching non-motorized boats poses minimal impacts to plant and wildlife species. Access for kayaking is typically by individuals or small groups. On average they transport one to four kayaks on top of their motorized vehicles. The use is restricted to non-motorized boats to avoid negative impacts on water quality from motor fuel and wake disturbance. Within the non-restricted areas of the refuge, vehicles must stay on the designated OSV routes to reduce impacts to the beach ecosystem. Based on biological data, conservation management plans, unreasonable harassment of wildlife, or destruction of the habitat, the manager may restrict the use or close some beaches and other areas from this and other public use, if it is determined that they could have negative impacts on the resources and on bird nesting activities.

Damage to habitat by walking or dragging a kayak to and from the launch sites is minimal and temporary. At current levels of use, we do not expect increased erosion because of boating activities. Another possible impact is litter from users which affects water quality and attracts predators to bird nesting areas. Litter also impacts the visual experience of visitors (Marion and Lime 1986). Several enforcement issues may result from the use, including trampling of vegetation following trespass into closed areas, illegal taking of fish (undersized, over limit), illegal fires, and disorderly conduct.

Popular public use boating seasons coincide in part with spring-early summer nesting and brood-rearing periods for many species of migratory birds. Boaters may disturb nesting birds by approaching too closely to nests, causing nesting birds to flush. Flushing may expose eggs to predation or cooling, resulting in egg mortality. Both adult and flightless young birds may be injured or killed if run over by speeding boats. Some disturbance of roosting and feeding shorebirds probably occurs (Burger 1981) but this will be minimized if closed areas are respected and OSV speed limits are obeyed. We will continue to close refuge areas seasonally to boating around sensitive nest sites, in conjunction with our conservation partners. We will also continue our public outreach and the placement of warning signs.

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004, 2005) found that while different species of invertebrates

respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmert 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to

declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_corkata_coast_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Landing and launching of non-motorized boats will only be allowed on sections of the beach that are open for public use. The beach is subject to seasonal closures for staging and breeding terns and plovers and loafing seals. Access by over-sand vehicles is authorized on designated routes and must be coordinated with the adjacent landowners, TTOR and the Nantucket Conservation Foundation.

Harassment of wildlife and excessive damage to vegetation is prohibited.

No kayaks or related equipment may be left overnight on the refuge unless the owner is surf fishing, which is the only authorized nighttime use.

Providing outfitting or commercial services for non-motorized boating on the refuge requires a special use permit issued by the refuge (see commercial tours and services compatibility determination).

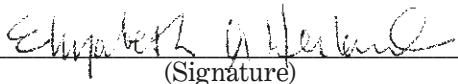
Occasional law enforcement patrol and regular staff and conservation partner presence should minimize potential violations. Refuge regulations will be posted and enforced.

Periodic evaluations will be done to insure that visitors are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an annual basis depending on geomorphology and wildlife use.

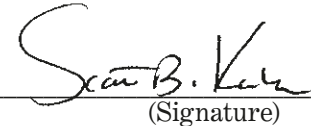
JUSTIFICATION:

This use has been determined compatible because allowing the general public to use non-motorized boats for wildlife observation, wildlife photography, and recreation will not interfere with the Service's work to protect and conserve natural resources. The level of use for these activities is moderate on the refuge. The associated disturbance to wildlife is temporary and minor. Although recreational kayaking is not priority public uses, under the conditions described above, they are not detrimental activities. Access for fishing, wildlife observation and photography, and environmental education and interpretation, which are priority uses, allows visitors to enjoy the outdoors and wild lands. Boating on Nantucket National Wildlife Refuge will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purposes for which the refuge was established.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

9/11/2022

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.
- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.

- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.
- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- Marion, J.L. And D.W. Lime. 1986. Recreational Resource Impacts: Visitor Perceptions and Management Responses. pp. 239-235. Kulhavy, D.L. and R.N. Conner, Eds. in *Wilderness and Natural Areas in the Eastern United States: A Management Challenge*. Center for Applied Studies, Austin State Univ., Nacogdoches, TX. 416pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.

- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Îles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.
- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S. Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Beachcombing

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate **Appropriate** ✓

Refuge Manager: Elyse A. Harkness Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Sharon J. Mann Date: 8/12/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Beachcombing

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Beachcombing can occur on the refuge beach when visitors collect shells, wildlife, plants, and other refuge resources. Allowing visitors to pick up shells and beach debris and take home a small amount of shells from the refuge will encourage an appreciation for the beach and marine environment. While this activity can have negative impacts on wildlife and habitat, as invertebrates which are a food source for shorebirds are at times attached to shells and other pieces of marine debris, it will not be conducted in areas which are being used by resting, nesting or feeding wildlife. Visitor use will be restricted in time and place to minimize disturbance to wildlife. Additionally, the refuge is a small part of a much larger Coskata-Coatue Peninsula, so the impact of beachcombing on the refuge will be diminished by the existence of many miles of beach habitat that has limited visitation.

COMPATIBILITY DETERMINATION

USE:

Beachcombing

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [16 U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

This use involves walking along the beach and picking up small amounts of shells and stones. The collection of plants and living animals would not be allowed.

(b) Is the use a priority public use?

Beachcombing is not specifically identified as priority public uses in the National Wildlife Refuge System Improvement Act of 1997, but beachcombing often leads to wildlife observation and interpretation, which are priority public uses.

(c) Where would the use be conducted?

Beachcombing could occur on any areas of Nantucket NWR that are open to public access. Public access is dictated by wildlife use and presence of sensitive vegetation. In general, much of the intertidal area and established vehicle trails through the dune system are open (at least to pedestrian traffic) for much of the year. Some areas of beach berm are closed seasonally to protect seals, nesting shorebirds, and seabirds. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures. Information about closures will also be available on the refuge Web site or at the Wauwinet Gatehouse when staffed.

(d) When would the use be conducted?

Nantucket NWR is open to beachcombing from ½ hour before sunrise to ½ hour after sunset. Beachcombing could occur any time of the year in any areas open to public access. Use for these activities is likely to be highest in summer and early fall.

(e) How would the use be conducted?

Beach combing must be conducted in accordance with refuge regulations (including seasonal closures). Beachcombing would be limited to the collection of small amounts of seashells and stones.

The use is primarily facilitated by pedestrian walking access or by operation of over-sand vehicles (OSVs), which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common.

A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is the use being proposed?

Beachcombing has historically occurred on Nantucket NWR. Although small, Nantucket NWR serves as a great example of dynamic barrier beach habitat that is constantly impacted by wind and tidal energy. A variety of wildlife use Nantucket NWR and surrounding waters year round. Affording opportunities for public enjoyment by collecting small amounts of shells and stones through beachcombing will increase visitor appreciation and foster a greater awareness of the importance of this site to the National Wildlife Refuge System.

AVAILABILITY OF RESOURCES:

Beachcombing is often one of many incidental activities that refuge visitors engage in when on the refuge. As such, we do not anticipate refuge costs associated with this activity alone.

ANTICIPATED IMPACTS OF PROPOSED ACTIONS:

Impacts of beachcombing will likely be minimal if conducted in accordance with refuge regulations. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. Beachcombing may intermittently interrupt the feeding habits of a variety of shorebirds, gulls, and terns. The removal of shells, wrack, and other natural debris from the beach may indirectly affect wildlife by reducing food availability and microhabitat used by invertebrates, which are in turn preyed upon by shorebirds.

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in a studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased

and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Roberson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Other studies have shown that if pedestrians cause incubating plovers to leave their nests, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1981, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

Beachcombing will be restricted spatially and temporally to minimize disturbance. Although some disturbance to migratory birds will occur, it should be minimal due to the location of the activity, the beach areas not impacted, and the closures in place to protect piping plovers, other shorebirds, and staging terns. In the event of persistent disturbance to habitat or wildlife, these activities will be further restricted or discontinued.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981, 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004, 2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance

of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations, shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmers 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to

declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_corkata_coast_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

Beachcombing will only be allowed on sections of the beach that are open for public use. The beach is subject to seasonal closures for staging and breeding plovers, other shorebirds, seabirds, and seals.

Occasional law enforcement patrol and regular staff or partner presence should minimize potential violations. The current refuge “open ½ hour before sunrise to ½ hour after sunset” regulation restricts entry after daylight hours and will be maintained. Refuge regulations will be posted and enforced.

Visitors will be provided information to ensure that they understand the value of shells, wildlife, plants on the refuge and particularly in the wrack line. Visitors will be informed to collect only small amounts of shells and stones. The collection of plants and living animals will not be permitted.


Visitors are also not permitted to collect any item prohibited by Federal law, such as historic artifacts, migratory birds, and marine mammals or parts thereof.

Periodic evaluations will be done to ensure that visitors are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an annual basis depending on geomorphology and wildlife use.

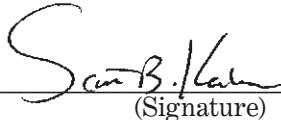
JUSTIFICATION:

Allowing visitors to collect small amounts of shells and stones while beachcombing will contribute to public appreciation of Nantucket NWR. Costs associated with administering these uses and likely visitor impacts are both minimal. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that beachcombing is a compatible use of the refuge.

SIGNATURE:

Refuge Manager:  7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief:  9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

9/11/2022

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.

- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Burger, J., and M. Gochfeld. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. *Environmental Conservation* 25:13-21.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.

- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping Plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The Impact of Human Disturbance on Shorebirds at a Migration Staging Area. *Biological Conservation* 60 (2) :115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthese des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuees aux Iles-de-la-Madeleine de 1987 a 1991. Association quebecoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.

- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name:** Nantucket National Wildlife Refuge**Use:** Sunbathing and Swimming

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?	✓	
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?	✓	

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ✓ No

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate **Appropriate** ✓

Refuge Manager: Elyse A. Heilman Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: Sharon J. Munn Date: 8/17/2012

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Sunbathing and Swimming

NARRATIVE:

Although Service policy does not specifically encourage sunbathing and swimming, these activities often facilitate priority uses such as wildlife observation and photography. The use is a traditional refuge activity that attracts many visitors, especially during the summer and early fall, which increases the refuge's ability to provide opportunities for the priority public uses described in the Refuge System Improvement Act of 1997. The use is not expected to have adverse impacts on refuge wildlife and habitat. Beaches will be closed seasonally in time and place to protect seals, shorebirds, and seabirds, and will be monitored for signs of disturbance.

COMPATIBILITY DETERMINATION

USE:

Sunbathing and Swimming

REFUGE NAME:

Nantucket National Wildlife Refuge

ESTABLISHING AND ACQUISITION AUTHORITY(IES):

Nantucket NWR was established in 1973 under an Act Authorizing the Transfer of Certain Real Property for Wildlife, or Other Purposes [16 U.S.C. § 667b].

REFUGE PURPOSE(S):

Nantucket NWR's purpose is its "... particular value in carrying out the national migratory bird management program." (16 U.S.C. § 667b-d, as amended)

NATIONAL WILDLIFE REFUGE SYSTEM MISSION:

To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

DESCRIPTION OF USE:

(a) What is the use?

The use is sunbathing and swimming on the refuge beach.

(b) Is the use a priority public use?

The use is not a priority public use of the National Wildlife Refuge System under the National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. § 668dd-668ee), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57). However, it has occurred on the refuge since its establishment. Visitors coming to the refuge to swim might find themselves observing wildlife, but that would not likely be the focus of these visits.

(c) Where would the use be conducted?

Beach sunbathing could occur on the sandy areas of Nantucket NWR that are open to public access. Swimming could occur in the waters off of the refuge shore. Public access is dictated by wildlife use and presence of sensitive vegetation. In general, much of the intertidal area and established vehicle trails through the dune system are open (at least to pedestrian traffic) for most of the year. Some areas of beach berm and intertidal areas are closed seasonally to protect seals, nesting shorebirds, and seabirds. Public access is further restricted during summer months when the road leading to the refuge is closed due to the presence of nesting piping plovers and least terns on the adjacent Trustees of Reservations (TTOR) land. Public access is currently restricted from dune habitat to minimize trampling of American beach grass (*Ammophila breviligulata*),

although a trail is proposed from the lighthouse to the beach on the Atlantic Ocean. Visitors should contact Eastern Massachusetts NWR Complex staff for up-to-date information on seasonal closures. Information about closures will also be available on the refuge Web site or through TTOR.

(d) When would the use be conducted?

Nantucket NWR is open to the public from ½ hour before sunrise to ½ hour after sunset. Sunbathing and swimming could occur any time of the year in any areas open to public access. Use for these activities is likely to be highest in summer and early fall.

(e) How would the use be conducted?

The use must be conducted in accordance with refuge regulations (including seasonal closures).

The use is primarily facilitated by pedestrian walking access or by operation of over-sand vehicles (OSVs), which consists of driving 4-wheel drive vehicles on designated areas of the refuge beach and inland sand roads. Over-sand vehicle use is currently the most common means of access for visitors to Nantucket NWR. However, visitors can (and some do) park on adjacent property owned by the Trustees of Reservations (TTOR) and walk to the refuge. The distance can range from 5 miles (if one parks at the Wauwinet Gatehouse) to mere steps (if one parks close to the property boundary). It is approximately 300 meters from the south boundary to the north boundary of Nantucket NWR. Access to Nantucket NWR can also occur by boat, but boat landings are not common.

A TTOR OSV permit is required for passage through the Wauwinet Gatehouse. While on Nantucket NWR, OSV use will generally be restricted to the area between the high tide line to the base of the foredunes, as well as established OSV roads that bisect dunes in natural sand valleys (for instance just south of the Great Point Lighthouse where the public restrooms are seasonally located). Over-sand vehicle users are not allowed to drive on dune habitat (Zone 1). Typically, OSVs may park anywhere the berm or crossroads are wide enough so as not to obstruct traffic. Additionally, OSV users are required to deflate tires to 12 pounds per square inch before passing through Wauwinet Gatehouse, and speed restrictions are well posted. Information on annual, seasonal, and daily closures (as well as a guide to safe OSV use) will be disseminated at the Wauwinet Gatehouse and closures will be well marked with informative signage. While on Nantucket NWR, all OSV users are expected to stay apprised of, and respect all closures and regulations. For instance, the current prohibition of dogs on Nantucket NWR also applies to dogs inside OSVs. Refuge staff will carefully monitor OSV use to ensure buffers and boundaries of zones for nesting and staging birds is sufficient to prevent disturbance. Closure areas may be increased if OSV access along the zone boundaries disrupts birds. If persistent violations or disturbance to natural resources occur, OSV access may be eliminated.

(f) Why is this use being proposed?

The beach on Nantucket NWR is located at the tip of Great Point. Visitors will come to this beach for a number of reasons, including sunbathing and swimming. Some people will come to the refuge for the experience of driving over 5 miles of beach to reach the very tip of the island, where you look out into the ocean in all directions. The refuge also supports seals, shorebirds, and seabirds, the Great Point lighthouse is only accessible from the refuge, and fishing is excellent on the refuge. Families will come with diverse interests. The ability to sunbathe and swim will increase the number of visits by entire families, and may prolong the amount of time that visitors spend on the refuge. Affording opportunities for public enjoyment by allowing this type of beach use will increase visitor appreciation and foster a greater awareness of the importance of this site to the National Wildlife Refuge System.

AVAILABILITY OF RESOURCES:

No additional resources are needed to facilitate sunbathing and swimming. The estimated costs of allowing these uses is minimal because there is little infrastructure involved and administration of these uses is done collectively in conjunction with other uses. These costs include all beach use activities, including walking and beachcombing. The costs associated with signage, law enforcement, and seasonal staff presence are common to all these uses.

Purchase new signage			\$2,000
Install new signage	2 staff	24 hours each	\$1,000
Total Initial Cost of Program:			\$3,000
Maintain signage	1 staff	24 hours	\$600
Occasional law enforcement presence	1 staff	40 hours	\$2,000
Seasonal staff presence	1 staff	200 hours	\$5,000
Fuel and Vehicle Costs			\$400
Total Annual Cost of Program:			\$8,000

ANTICIPATED IMPACTS OF THE USE:

Impacts of sunbathing and swimming will likely be minimal if conducted in accordance with refuge regulations. Possible impacts include disturbing wildlife, removing or trampling of plants, littering, vandalism, and entrance into closed areas. A temporary interruption of feeding or roosting behavior of migratory birds may occur at the approach of beachgoers on foot or by boat. Once visitors get settled in their chosen spot on the beach, however, they tend to be sedentary and migratory birds usually resume their activities just a short distance away.

Potential Pedestrian Travel Impacts

Potential Direct Impacts

Pedestrian travel has the potential of impacting shorebird, waterfowl, and other migratory bird populations feeding and resting near the trails and on beaches during certain times of the year. Pedestrians can also impact seals resting on the beach if they get too close. Conflicts arise when migratory birds and humans are present in the same areas (Boyle and Samson 1985). Response of wildlife to human activities includes: departure from site (Owen 1973, Burger 1981, Kaiser and Fritzell 1984, Korschgen et al. 1985, Henson and Grant 1991, Kahl 1991, Klein 1993), use of sub-optimal habitat (Erwin 1980, Williams and Forbes 1980), altered behavior (Burger 1981, Korschgen et al. 1985, Morton et al. 1989, Ward and Stehn 1989, Havera et al. 1992, Klein 1993), and increase in energy expenditure (Morton et al. 1989, Belanger and Bedard 1990).

Numerous studies have documented that migratory birds are disturbed by human activity on beaches. Erwin (1989) documented disturbance of common terns and skimmers and recommended that human activity be restricted a distance of 100 meters around nesting sites. Klein (1993) in studying waterbird response to human disturbance found that as intensity of disturbance increased, avoidance response by the birds increased and found that out of vehicle activity to be more disruptive than vehicular traffic. Pfister et al. (1992) found that the impact of disturbance was greater on species using the heavily disturbed front side of the beach, with the abundance of the impacted species being reduced by as much as 50 percent. Robertson et al. (1980) discovered, in studying the effects of recreational use of shorelines on nesting birds, that disturbance negatively impacted species composition. Piping plovers which use the refuge heavily are also impacted negatively by human activity. Pedestrians on beaches may crush eggs (Burger 1987, Hill 1988, Shaffer and Laporte 1992, Cape Cod National Seashore 1993, Collazo et al. 1994). Dogs may chase plovers (McConnaughey et al. 1990), destroy nests (Hoopes et al. 1992), and kill chicks (Cairns and McLaren 1980). Other studies have shown that if pedestrians cause incubating plovers to leave their nest, the eggs can overheat (Bergstrom 1991) or the eggs can cool to the point of embryo death (Welty 1982). Pedestrians have been found to displace unfledged chicks (Strauss 1990, Burger 1991, Hoopes et al. 1992, Loegering 1992, Goldin 1993).

The Delaware Natural Heritage Program, Division of Fish & Wildlife and the Department of Natural Resources and Environmental Control prepared a document on the “The Effects of Recreation on Birds: A literature Review” which was completed in April of 1999. The following information was referenced from this document:

Several studies have examined the effects of recreation on birds using shallow water habitats adjacent to trails and roads through wildlife refuges and coastal habitats in the eastern United States (Burger 1981; Burger 1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1995, 1997; Burger & Gochfeld 1998). Overall, the existing research clearly demonstrates that disturbance from recreation activities always have at least temporary effects on the behavior and movement of birds within a habitat or localized area (Burger 1981,

1986; Klein 1993; Burger et al. 1995; Klein et al. 1995; Rodgers & Smith 1997; Burger & Gochfeld 1998). The findings that were reported in these studies are summarized as follows in terms of visitor activity and avian response to disturbance.

Presence: Birds avoided places where people were present and when visitor activity was high (Burger 1981; Klein et al. 1995; Burger & Gochfeld 1998).

Distance: Disturbance increased with decreased distance between visitors and birds (Burger 1986), though exact measurements were not reported.

Approach Angle: Visitors directly approaching birds on foot caused more disturbance than visitors driving by in vehicles, stopping vehicles near birds, and stopping vehicles and getting out without approaching birds (Klein 1993). Direct approaches may also cause greater disturbance than tangential approaches to birds (Burger & Gochfeld 1981; Burger et al. 1995; Knight & Cole 1995a; Rodgers & Smith 1995, 1997).

Noise: Noise caused by visitors resulted in increased levels of disturbance (Burger 1986; Klein 1993; Burger & Gochfeld 1998), though noise was not correlated with visitor group size (Burger & Gochfeld 1998).

The proposed use has the potential of intermittently interrupting the feeding habits of a variety of shorebirds, gulls, and terns, but encounters between pedestrians and migratory birds will be temporary. Refuge staff will manage visitor access via seasonal closures to minimize disturbance to nesting, resting, and foraging waterbirds on the refuge.

Pedestrian use also has the potential to disturb loafing seals. Gray and harbor seals haul-out on the refuge year round. A 150-foot buffer around all seals is required by the National Oceanic Atmospheric Administration to ensure compliance with the Marine Mammals Protection Act.

Pedestrian Indirect Impacts

Heavy beach use can dry out the sand and contribute to beach erosion. Trash left on the beach, particularly food or wrappers can attract predators that prey on nesting piping plovers and least terns or roosting shorebirds. Impacts of walking are likely to be minimal if conducted in accordance with refuge regulations. The new trail we propose to establish is on an existing unauthorized trail. The remaining unauthorized trails will be shut down, reducing the amount of disturbance from walkers through the dune habitat. We will manage refuge closures which restrict pedestrian access to minimize disturbance to priority avian species during critical times of the year. Closures can be expanded or contracted as needed depending on bird activity and results of further disturbance studies

Potential OSV Impacts

Although a specific study on the effects of OSV use has not been conducted on Nantucket NWR, studies have been done on beaches with similar ecological characteristics. Studies show that OSVs affect the physical and biological processes that take place within the beach ecosystem. Specifically, OSV use on the beach may result in the following negative impacts.

Foredune Profile

Over the long term, OSV use can have a negative effect on foredune growth. Long term OSV use can lead to an abrupt rather than sloping dune base, leaving the dune more susceptible to wave energy and erosion (Anders and Leatherman 1987a). The tracks created by OSV use can also affect the geomorphology of the beach through sand displacement and compaction (Schlacher and Thompson 2008). The amount of sand displaced increases as the number of vehicles (traffic flow) increases. Sand displacement is most pronounced with the first few vehicles (up to 10), and is most crucial near the foredune, where the highest sand displacement occurs, leading to steeper slopes. The use of wide tires with low pressure can reduce some of these impacts (Anders and Leatherman 1987b).

Wrack Habitat and Macroinvertebrates

Living organisms concentrate in the wrack lines that wash up during high tide. For example, bacteria, which play a vital role in breaking down organic matter, are 1,000 times more abundant in the wrack than

on bare sand. If OSVs drive over wrack habitat, they may break it up and/or dry it out. Godfrey and Godfrey (1980) found that OSV use reduced the amount of bacteria present by 50 percent and the amount of diatoms in the sand by 90 percent. Steinback et al. (2004, 2005) found that while different species of invertebrates respond differently to OSV use (some populations increase while others decrease), the overall abundance of invertebrates is significantly lower in beaches with OSV use. Steinback et al. also found less wrack on beaches with OSV use. Organisms found in the wrack are an important food source for nesting and migrating shorebirds including piping plovers. Over-sand vehicle use has also been shown to directly reduce macroinvertebrate density and diversity (Wolcott and Wolcott 2003, Schlacher et al. 2008), which reduces biological integrity and also may impact birds which forage on these species.

Vegetation

Over-sand vehicle use reduces vegetative cover (Anders and Leatherman 1987a) and species diversity through trampling, and can also result in a slower rate of plant recolonization (Godfrey and Godfrey 1980). Off-road vehicle use can cause soil compaction for ORV use and thus limit moisture and oxygen available for germinating seeds (Gehlhausen and Harper 1998). Plant seeds in trampled and dried out wrack lines may not reproduce. Reduced vegetation likely contributes to increased susceptibility to wave- and wind-driven erosion.

Nesting Birds

The Service's 2009 Five-year Status Review cites disturbance by humans as a continuing widespread and severe threat to Atlantic Coast piping plovers (USFWS 2009). Threats from human beach-users are cited in the final listing rule (USFWS 1985) and described in detail in the revised Atlantic Coast recovery plan (USFWS 1996). Threats to breeding piping plovers from both motorized and non-motorized beach recreation activities are relatively well understood, and recommended management options are described in the *Guidelines for Managing Recreation* (USFWS 1994).

Studies have shown that beach use including use of OSVs negatively impacts productivity of beach-nesting birds, particularly piping plovers. Vehicles have been shown to crush eggs, adults, and chicks (Wilcox 1959, Tull 1984, Burger 1987, Patterson et al. 1991, Shaffer and Laporte 1992). Cairns (1977) found reproductive success of piping plovers was 1.3 to 2.1 fledged young per pair on remote beaches but only 0.7 to 1.1 fledged young per pair on beaches used for recreation in Nova Scotia. Fleming (1984) calculated that fledgling success per nest attempt on beaches in Nova Scotia was significantly reduced from 1.8 to 0.5 young per pair for birds exposed to low and high recreational activity, respectively. He defined low activity as 0-20 visits per week and high activity as 30 or more visits per week by people and their vehicles. Fleming also found that piping plover chick survivorship was significantly decreased by higher levels of recreational activity. His results showed that most chick loss occurred between the ages of 10-17 days; he speculated that high levels of recreational activity caused mortality of chicks by interfering with feeding during a critical period of energy demand. MacIvor et al. (1987) observed piping plovers on North Beach in Chatham, Massachusetts. Following separation from the mainland during a 1987 storm, this area, which had received extensive OSV use, became inaccessible to vehicles. In 1987, 50 percent of plover pairs shifted their nest sites to areas that were not available for nesting in 1985 or 1986 due to OSV traffic. Further, all three least tern colonies were also in locations that were formerly unavailable due to OSV use. Six years of data collected by Strauss et al. (1986) in Barnstable, Massachusetts show that in their study area, the number of fledglings per nesting pair of plovers in an area with only light pedestrian use was 0.67, compared with 0.32 in an adjacent area with heavy OSV use. Their study also shows that while adult plovers will often move their chicks to feeding habitat with lower levels of disturbance, chicks moved more than 200 meters have half the probability of fledging than those moved less than 200 meters.

It has been documented that piping plover chicks will tend to run along ruts caused by vehicles and remain motionless as vehicles approach (USFWS 1996). Piping plover chicks may also have difficulty crossing deep ruts and moving quickly enough out of a vehicles path. Additionally, piping plovers tend not to reach their full habitat carrying capacity on beaches where vehicles are allowed during the nesting and brood rearing periods (USFWS 1996).

Migrating Birds

Many species of shorebirds (*Charadriiformes*) that breed in North America migrate up to 30,000 kilometers annually, traveling from non-breeding grounds as far south as Argentina to breeding grounds as far north as the Arctic Ocean (Brown et al. 2001, Morrison 1984, Myers et al. 1987). During these long distance migrations,

shorebirds rely on strategically located stopover sites which provide abundant food and adjacent resting habitat (Helmert 1992, Myers et al. 1987, Senner & Howe 1984). Coastal stopover sites in particular are increasingly being subjected to development and human disturbance, and loss of suitable stopover habitat may contribute to declines in local abundance and overall populations of shorebirds in North America (Brown et al. 2001, Myers et al. 1987, Pfister et al. 1992).

Studies have shown reduced numbers of migrating shorebirds in response to vehicle traffic on beaches. For example, Pfister et al. (1992) documented long term declines in abundance of red knots (*Calidris canutus*) and short-billed dowitchers (*Limnodromus griseus*) on Plymouth Beach, Massachusetts, that exceeded declines at comparable, less disturbed sites, as well as the overall eastern North American population. Vehicle presence also caused semipalmated sandpipers (*Calidris pusilla*) and sanderlings (*Calidris alba*) to alter their distribution on the beach. A study at Parker River NWR in Newburyport, Massachusetts found that vehicle use on beaches disturbed roosting shorebirds more than pedestrian use (Harrington and Drilling 1996). Off road vehicle use reduces food resources and increases disturbance, contributing to lower weight shorebirds. Lower weight individuals are less likely to successfully complete their long-distance migrations (Harrington and Drilling 1996). The North Atlantic Shorebird Plan identified protection of food resources and minimizing human disturbance as high priority management objectives (Clark and Niles 2003). We have not quantified migrating shorebird use of Nantucket NWR, but data on species use, and potential disturbance, may be collected in future years.

While we acknowledge the potential impacts of OSV on the physical and biological characteristics of a beach ecosystem, Nantucket NWR is only about 21 acres, and most impacts from OSV on this small area are not likely to detract significantly from the larger landscape. However, we are committed to reducing direct disturbance on nesting, staging, and migrating birds (and seals), as well as protecting the integrity of the dune system and wrack line as much as possible. Seasonal closures for bird and seals, and prohibitions on OSV access in the dune system and along the wrack line will minimize the overall impact of OSV use on Nantucket NWR. The Trustees of Reservations has produced and distributes a guide to OSV use which likely increases voluntary compliance and user safety, and may further lessen disturbance to natural resources. The guide is available at: http://www.thetrustees.org/pages/293_cuskata_coastal_wildlife_refuge.cfm (accessed March 2011).

PUBLIC REVIEW AND COMMENT:

As part of the comprehensive conservation planning process for Nantucket NWR, this compatibility determination underwent extensive public review, including a comment period of 30 days that followed the release of the draft Comprehensive Conservation Plan and Environmental Assessment.

DETERMINATION (CHECK ONE BELOW):

- ☐ Use is not compatible.
- ☒ Use is compatible with the following stipulations.

STIPULATIONS NECESSARY TO ENSURE COMPATIBILITY:

The refuge will be managed to protect seals, nesting shorebirds, and all resting and foraging seabirds. Closures will be maintained to reduce impacts from all public use at certain times and in specific places. Swimming and sunbathing will not be allowed in closed areas.

Occasional law enforcement patrol and regular staff and conservation partner presence should minimize potential violations. The current refuge “open ½ hour before sunrise to ½ hour after sunset” regulation restricts entry after daylight hours and will be maintained. Refuge regulations will be posted and enforced.

Periodic evaluations will be done to insure that visitors are not causing unacceptable adverse impacts. Areas open to these uses will be evaluated on an annual basis depending on geomorphology and wildlife use.

JUSTIFICATION:

Allowing sunbathing and swimming will contribute to public appreciation of Nantucket NWR. Costs associated with administering these uses and likely visitor impacts are both minimal. These uses will not materially interfere with or detract from the mission of the National Wildlife Refuge System or the purpose of Nantucket NWR. Therefore, it is the determination of the Service that swimming and sunbathing are compatible uses of the refuge.

SIGNATURE:

Refuge Manager: Stephen D. Harland 7/25/2012
(Signature) (Date)

CONCURRENCE:

Regional Chief: Sean B. Lane 9/11/2012
(Signature) (Date)

MANDATORY 10 YEAR RE-EVALUATION DATE:

9/11/2022

LITERATURE CITED:

- Anders, F. and S. Leatherman. 1987a. Effects of off-road vehicles on coastal foredunes at Fire Island, New York, USA. *Environmental Management* 11(1): 45-52.
- Anders, F. and S. Leatherman. 1987b. Distance of beach sediment by off-road vehicles. *Environmental Geologic Water Science*. 9(3):183-189.
- Belanger, L., and J. Bedard. 1990. Energetic cost of man-induced disturbance to staging snow geese. *Journal of Wildlife Management*. 54:36.
- Bergstrom, P.W. 1991. Incubation temperatures of Wilson's plovers and killdeer. *Condor*. 91: 634-641.
- Boyle, S. A., F. B. Samson. 1985. Effects of nonconsumptive recreation on wildlife: A review. *Wildl. Soc. Bull.* 13:110.
- Brown, S.C., C. Hickey, B. Harrington & R. Gill (eds). 2001. *The U.S. Shorebird Conservation Plan, Second Edition*. Manomet Center for Conservation Sciences, Manomet, Massachusetts.
- Burger, J. 1981. The effect of human activity on birds at a coastal bay. *Biological Conservation*. 21:231-241.
- Burger, J., and M. Gochfeld. 1981. Discrimination of the threat of direct versus tangential approach to the nest by incubating herring and great black-backed gulls. *J. Comparative Physiological Psychology* 95:676-684.
- Burger, J. 1986. The effect of human activity on shorebirds in two coastal bays in northeastern United States. *Biological Conservation* 13:123-130.
- Burger, J. 1987. New Jersey Endangered Beach-Nesting Bird Project: 1986 Research. Unpublished report. New Jersey Department of Environmental Protection, New Jersey. 37 pp.
- Burger, J. 1991. Foraging behavior and the effect of human disturbance on the piping plover (*Charadrius melodus*). *Journal of Coastal Research*, 7(1):39-52.

- Burger, J., M. Gochfeld, and L. J. Niles. 1995. Ecotourism and birds in coastal New Jersey: Contrasting responses of birds, tourists, and managers. *Environmental Conservation* 22:56-65.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds*. 34:206-208.
- Burger, J., and M. Gochfeld. 1998. Effects of ecotourists on bird behaviour at Loxahatchee National Wildlife Refuge, Florida. *Environmental Conservation* 25:13-21.
- Cairns, W. E. 1977. Breeding Biology and Behavior of the Piping Plover in Southern Nova Scotia. M. Sc. Thesis, Dalhousie University, Halifax, Nova Scotia. 115 pp.
- Cairns, W.E. and I.A. McLaren. 1980. Status of the piping plover on the east coast of North America. *American Birds* 34: 206-208.
- Cape Cod National Seashore. 1993. Piping plover nest found trampled by pedestrian. News Release. Cape Cod National Seashore, South Wellfleet, Massachusetts. 2 pp.
- Collazo, J.A., J.R. Walters, and J.F. Parnell. 1994. Factors Affecting Reproduction and Migration of Waterbirds on North Carolina Barrier Islands. 1993 Annual Progress Report. North Carolina State University, Raleigh, North Carolina. 57 pp.
- Erwin, R.M. 1980. Breeding habitat by colonially nesting water birds in 2 mid-Atlantic U.S. regions under different regimes of human disturbance. *Biological Conservation*. 18:39-51.
- Erwin, M.R. 1989. Responses to Human Intruders by Birds Nesting in Colonies: Experimental Results and Management Guidelines. *Colonial Waterbirds* 12 (1) :104-108.
- Fleming, S. P. 1984. The Status and Responses of Piping Plovers to Recreational Activity in Nova Scotia. Honors Thesis, Acadia University, Wolfville, Nova Scotia. 150 pp.
- Gehlhausen, S. and M. G. Harper. 1998. Management of maritime communities for threatened and endangered species. U.S. Army Corps of Engineers, Construction Engineering Research Laboratories Technical Report 98/79.
- Godfrey, P. and M. Godfrey. 1980. Ecological effects of off-road vehicles on Cape Cod. *Oceanus*. 23 (4): 56-67.
- Goldin, M.R. 1993. Effects of human disturbance and off-road vehicles on piping plover reproductive success and behavior at Breezy Point, Gateway National Recreation Area, New York, M.S. Thesis. University of Mass., Amherst, MA. 128 pp.
- Harrington, B.A., and N. Drilling. 1996. Investigations of effects of disturbance to migratory shorebirds at migration stopover sites on the U.S. Atlantic Coast. A report to the U.S. Fish & Wildlife Service, Region 5, Migratory Bird Program. Hadley, Massachusetts. 87 pp.
- Havera, S.P., L.R. Boens, M.M. Georgi, and R. T. Shealy. 1992. Human disturbance of waterfowl on Keokuk Pool, Mississippi River. *Wildlife Society Bulletin*. 20:290-298.
- Helmets, D.L. 1992. *Shorebird Management Manual*. Manomet Center for Conservation Sciences. Manomet, Massachusetts.
- Henson, P.T., and A. Grant. 1991. The effects of human disturbance on trumpeter swan breeding behavior. *Wildlife Society Bulletin*. 19:248-257.
- Hill, J.O. 1988. Aspects of breeding biology of Piping Plovers *Charadrius melodus* in Bristol County, Mass., in 1988. Unpublished report. University of Mass., Amherst, MA. 44 pp.
- Hoopes, E.M., C.R. Griffin, and S.M. Melvin. 1992. Relationship between human recreation and Piping Plover foraging ecology and chick survival. Unpublished report. University of Mass., Amherst, MA. 77 pp.
- Kahl, R. 1991. Boating disturbance of canvasbacks during migration at Lake Poygan, Wisconsin. *Wildlife Society Bulletin*. 19:242-248.
- Kaiser, Mark S. and E. K. Fritzell. 1984. Effects of River Recreationists on Green-Backed Heron Behavior. *The Journal of Wildlife Management*, Vol. 48, No. 2 (Apr., 1984), pp. 561-567.
- Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. *Wildlife Society Bulletin*. 21:31-39.
- Klein, M. L., S. R. Humphrey, and H. F. Percival. 1995. Effects of ecotourism on distribution of waterbirds in a wildlife refuge. *Conservation Biology* 9:1454-1465.

- Knight R. L., and D. N. Cole. 1995. Wildlife responses to recreationists. Pages 51-69 in R.L. Knight and D.N. Cole, editors. *Wildlife and recreationists: coexistence through management and research*. Washington, D.C., Island Press. Knight, R. L., and K. J. Gutzwiller eds. 1995. *Wildlife and recreationalists: coexistence through management and research*. Island Press, Washington, D.C. 372 pp.
- Korschgen, Carl E., L.S. George, and W.L. Green. 1985. Disturbance of Diving Ducks by Boaters on a Migrational Staging Area. *Wildlife Society Bulletin*, Vol. 13, No. 3 (Autumn, 1985), pp. 290-296.
- Loefering, J.P. 1992. Piping plover breeding biology, foraging ecology and behavior on Assateague Island National Seashore, Maryland. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, Virginia. 247 pp.
- MacIvor, L. H., C. Griffin, and S. Melvin. 1987. Management, Habitat Selection, and Population Dynamics of Piping Plovers on Outer Cape Cod, Massachusetts 1985-1987. Unpublished Report. University of Massachusetts, Amherst, Massachusetts. 11 pp.
- McConnaughey, J.L., J.D. Fraser, S.D. Coutu, and J.P. Loefering. 1990. Piping plover distribution and reproductive success on Cape Lookout National Seashore. Unpublished report. Cape Lookout National Seashore, Morehead City, North Carolina. 83 pp.
- Morrison, R.I.G. 1984. Migrations systems of some New World shorebirds. Pp. 125–202 in *Behavior of Marine Animals. Vol. 6. Shorebirds: Migration and Foraging Behavior*. J. Burger & B.L. Olla, eds. Plenum Press, New York.
- Morton, J.M., A.C. Fowler, and R.L. Kirkpatrick. 1989. Time and energy budgets of American black ducks in winter. *Journal of Wildlife Management*. 53:401-410.
- Myers, J.P., R.I.G. Morrison, P.Z. Antas, B.A. Harrington, T.E. Lovejoy, M. Sallaberry, S.E. Senner & A. Tarak. 1987. Conservation strategy for migratory species. *American Scientist* 75: 19–26.
- Owen, M. 1973. The management of grassland areas for wintering geese. *Wildfowl*. 24:123-130.
- Patterson, M. E., J. D. Fraser, and J. W. Roggenbuck. 1991. Factors affecting piping plover productivity on Assateague Island. *Journal of Wildlife Management*. 55(3): 525-531.
- Pfister, C., B. A. Harrington, and M. Lavine. 1992. The impact of human disturbance on shorebirds at a migration staging area. *Biological Conservation*. 60:115-126.
- Robertson, R. J. and N. J. Flood. 1980. Effects of Recreational Use of Shorelines on Breeding Bird Populations. *Canadian Field-Naturalist* 94 (2) :131-138.
- Rodgers, J. A., and H. T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. *Conservation Biology* 9:89-99.
- Rodgers, J. A., and H. T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. *Wildlife Society Bulletin* 25:139-145.
- Schlacher, T. and L. Thompson. 2008. Physical impacts caused by off-road vehicles to sandy beaches: Spatial quantification of car tracks on an Australian barrier island. *Journal of Coastal Research* 24: 234-242.
- Schlacher, T. A., D. Richardson, and I. McLean. Impacts of off-road vehicles (ORVs) on macrobenthic assemblages on sandy beaches. *Environmental Management* 41: 878-892.
- Senner, S.E. & M.A. Howe. 1984. Conservation of Nearctic shorebirds. Pp. 379–421 in *Shorebirds: breeding behavior and populations*. J. Burger & B. Olla, eds. Plenum Press, New York, New York.
- Shaffer, F. and P. Laporte. 1992. Rapport synthèse des recherches relatives au pluvier siffleur (*Charadrius melodus*) effectuées aux Îles-de-la-Madeleine de 1987 à 1991. Association québécoise des groupes d'ornithologues et Service canadien de la faune. 78 pp.
- Strauss, E. 1990. Reproductive success, life history patterns, and behavioral variation in a population of Piping Plovers subjected to human disturbance (1982-1989). Ph.D. dissertation. Tufts University, Medford, Massachusetts.
- Strauss, E. G., P. J. Auger, J. A. Chamberlain-Auger, and B. Dane. 1986. Reproductive Success in a Stressed Population of Piping Plovers. Department of Biology, Tufts University, Medford, Massachusetts. 20 pp.
- Steinback, J.M.K., H.S. Ginsberg, and R.M. Cerrato. 2004/2005. The effect of off-road vehicles (ORVs) on beach invertebrates in the northeastern United States. University of Rhode Island Doctoral Thesis. Kingston, Rhode Island.

- Tull, C.E. 1984. A study of nesting piping plovers of Kouchibouguac National Park 1983. Unpublished report. Parks Canada, Kouchibouguac National Park, Kouchibouguac, New Brunswick. 85 pp.
- U.S. Fish and Wildlife Service [USFWS]. 1985. Determination of endangered and threatened status for the piping plover. *Federal Register* 50:50726-50734.
- U.S. Fish and Wildlife Service. 1994. Guidelines for managing recreational activities in piping plover breeding habitat on the U.S. Atlantic Coast to avoid take under Section 9 of the Endangered Species Act. Northeast Region, U.S. Department of the Interior, Fish and Wildlife Service, Hadley, Massachusetts.
- U.S. Fish and Wildlife Service. 1996. Piping Plover (*Charadrius melodus*), Atlantic Coast Population, Revised Recovery Plan. Hadley, Massachusetts. 258 pp.
- U. S. Fish and Wildlife Service. 2009. Piping Plover (*Charadrius melodus*), 5-Year Review: Summary and Evaluation. U. S Fish and Wildlife Service. Hadley, Massachusetts and East Lansing, Michigan. 206 pp.
- Ward, D.H., and R.A. Stehn. 1989. Response of Brant and other geese to aircraft disturbance at Izembek Lagoon, Alaska. U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center. Final report to the Minerals Management Service. Anchorage, Alaska. 193 pp.
- Welty, J.C. 1982. The life of birds. Sauders College Publishing, Philadelphia, Pennsylvania. 754 pp.
- Wilcox, L. 1959. A twenty year banding study of the piping plover. *Auk*. 76:129-152.
- Williams, G.J., and E. Forbes. 1980. The habitat and dietary preferences of dark-bellied Brant geese and widgeon in relation to agricultural management. *Wildfowl*. 31:151-157.
- Wolcott, T.G. and D.L. Wolcott. 1984. Impact of off-road vehicles on macroinvertebrates of a mid-Atlantic beach. *Biological Conservation*. 29:217-240.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Organized Picnicking

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use (“no” to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (“no” to [b], [c], or [d]) may not be found appropriate. If the answer is “no” to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ☒ **Appropriate** ☐

Refuge Manager: Elmyrae A. Harris Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Organized Picnicking

NARRATIVE:

Service policy does not encourage picnicking, although it is recognized to occur incidental to the priority public uses described in the Refuge System Improvement Act of 1997. The refuge does not provide amenities for any large scale or organized gatherings for this activity. Allowing this activity would enable visitors to bring food and picnic while not participating in wildlife-dependent recreation. Introducing food to the beach ecosystem would encourage scavengers and likely impact the natural balance of the food chain, potentially causing harm to priority species that the refuge seeks to protect. The use is expected to have potentially significant adverse impacts on refuge wildlife and habitat and would require monitoring by refuge staff above refuge resource capacity. In addition, the use is expected to detract from the mission of the National Wildlife Refuge System, and potentially diminish the purpose for which the refuge was established.

This finding for organized picnicking should not be read as banning all food and drink of the refuge. We understand that those engaged in most permitted uses of the refuge will bring food and drink, as appropriate, for consumption while engaged in those uses, and we take this into account in analyzing the impacts of those uses. The refuge is a leave-no-trace, carry-in-carry out facility. All food containers, bottles, and other waste and refuse must be taken out. Littering, dumping, and abandoning property are prohibited by Federal regulation at 50 C.F.R. 27.93.94.

FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Beach Sports and Kite Flying

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use (“no” to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (“no” to [b], [c], or [d]) may not be found appropriate. If the answer is “no” to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ☒ **Appropriate**

Refuge Manager: Elizabeth A. Herland Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Beach Sports and Kite Flying

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Beach sports include, but are not limited to, volleyball, football, soccer, frisbee, baseball, surfing, and skim boarding. Kite-related activities include kite flying, kite surfing, and kite boarding. These activities are determined to be inappropriate because they disturb wildlife and increase beach erosion and habitat destruction. These uses do not contribute to quality, wildlife-dependent, recreational uses nor do they support the purpose for which the refuge was established.

Refuge Name: Nantucket National Wildlife Refuge

Use: Bicycling

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?	✓	
(h) Will this be manageable in the future within existing resources?	✓	
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use (“no” to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (“no” to [b], [c], or [d]) may not be found appropriate. If the answer is “no” to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes ☒ No ☐

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ☒ **Appropriate**

Refuge Manager: Elizabeth A. Harkin Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Bicycling

NARRATIVE:

To access the refuge by land, visitors must cross more than five miles of sandy beach on foot or in permitted over-sand vehicles. None of the trails on the refuge are maintained for bicycles. The Trustees of Reservations (TTOR) do not allow bicycles on their adjacent property, the Coskata-Coatue Wildlife Refuge, which visitors have to pass through to access the refuge. There is limited vehicular access on the refuge, and bicycles would be in conflict with vehicles in the limited area that would be available for bicycle use. The refuge is only about 21 acres, so access by bicycle is not necessary to provide the visitor an opportunity to see wildlife throughout the refuge. Controlled over-sand vehicle use and pedestrian access is sufficient to provide the public with opportunities to observe wildlife and enjoy the natural conditions on the refuge. Given the difficult cycling conditions on the refuge and restrictions of the abutting TTOR property, bicycling is not an appropriate recreational use for Nantucket National Wildlife Refuge.

Use: Camping

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

B-119

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Camping

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Camping is not consistent with Service policy on secondary uses and would divert existing and future resources from accomplishing priority tasks. It also presents unacceptable levels of risk from the potential spread of campfires to wildfires. The refuge is only about 21 acres in size, and there is not enough space on the refuge to allow camping without disturbing wildlife or having an adverse impact on the vegetation and dune habitat. Additionally, the town of Nantucket does not allow camping anywhere on Nantucket Island, so allowing the use on the refuge would not support the town of Nantucket’s position on camping. The use does not support the refuge’s purpose in carrying out the national migratory bird program. This use is also not consistent with any approved refuge management plan. While there would be some benefit for the visitor to experience wildlife and nature on the refuge through camping, the lack of staff and financial resources to manage the use and the conflict it would cause with other users, as well as the impact on refuge plant and wildlife resources, makes this an inappropriate use.

Use: Fires

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

B-121

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Fires

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Fires are not appropriate wildlife-dependent, recreational activities, nor does the refuge have the resources needed to manage this activity. Fires can disturb nesting shorebirds that use the refuge and have the potential to spread and endanger plants, wildlife, and public safety. Fires also are associated with nonwildlife-dependent forms of recreation, some of which have been found not to be appropriate. The use does not support the refuge’s establishing purpose to provide for migratory birds.

FWS Form 3-2319
02/06**FINDING OF APPROPRIATENESS OF A REFUGE USE**Refuge Name: Nantucket National Wildlife RefugeUse: Fireworks

This form is not required for wildlife-dependent, recreational uses, take regulated by the State, or uses already described in a refuge CCP or step-down management plan approved after October 9, 1997.

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?		✓
(c) Is the use consistent with applicable Executive orders and Department and Service policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?	✓	
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

Where we do not have jurisdiction over the use ("no" to [a]), there is no need to evaluate it further as we cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe ("no" to [b], [c], or [d]) may not be found appropriate. If the answer is "no" to any of the other questions above, we will **generally** not allow the use.

If indicated, the refuge manager has consulted with State fish and wildlife agencies. Yes _____ No ✓

When the refuge manager finds the use appropriate based on sound professional judgment, the refuge manager must justify the use in writing on an attached sheet and obtain the refuge supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is that the proposed use is:

Not Appropriate ✓ Appropriate _____

Refuge Manager: Elizabeth A. Herlihy Date: 7/25/2012

If found to be **Not Appropriate**, the refuge supervisor does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside the CCP process, the refuge supervisor must sign concurrence.

If found to be **Appropriate**, the refuge supervisor must sign concurrence.

Refuge Supervisor: _____ Date: _____

A compatibility determination is required before the use may be allowed.

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Fireworks

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Fireworks are not an appropriate use on the refuge. The size of the refuge is so small that there is no place on the refuge where this use could be accommodated with stipulations. Additionally, fireworks pose significant impacts to wildlife and habitat, especially during the summer and early fall when shorebirds nest on the refuge. In addition, fireworks are a public safety risk that could start wildfires or cause injury to refuge visitors. This use does not support the refuge’s establishing purpose to provide for migratory birds.

Use: Pets

Decision criteria:	YES	NO
(a) Do we have jurisdiction over the use?	✓	
(b) Does the use comply with applicable laws and regulations (Federal, State, Tribal, and local)?	✓	
(c) Is the use consistent with applicable Executive orders and Department and Service policies?	✓	
(d) Is the use consistent with public safety?	✓	
(e) Is the use consistent with goals and objectives in an approved management plan or other document?		✓
(f) Has an earlier documented analysis not denied the use or is this the first time the use has been proposed?		✓
(g) Is the use manageable within available budget and staff?		✓
(h) Will this be manageable in the future within existing resources?		✓
(i) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to the refuge's natural or cultural resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent, recreational uses or reducing the potential to provide quality (see section 1.6D, 603 FW 1, for description), compatible, wildlife-dependent recreation into the future?		✓

B-125

JUSTIFICATION FOR A FINDING OF APPROPRIATENESS OF A REFUGE USE

Refuge Name: Nantucket National Wildlife Refuge

Use: Pets

NARRATIVE:

The Service policy on Appropriate Refuge Uses (603 FW 1) states that: “General public uses that are not wildlife-dependent, recreational uses (as defined by the Improvement Act) and do not contribute to the fulfillment of refuge purposes or goals or objectives as described in current refuge management plans are the lowest priorities for refuge managers to consider. These uses are likely to divert refuge management resources from priority general public uses or away from our responsibilities to protect and manage fish, wildlife, and plants, and their habitats. Therefore, both law and policy have a general presumption against allowing such uses within the Refuge System.”

Dogs and other pets can have a significant impact on wildlife. The presence of dogs may flush incubating birds from nests (Yalden and Yalden 1990), disrupt breeding displays (Baydack 1986), disrupt foraging activity in shorebirds (Hoopes 1993), and disturb roosting activity in ducks (Keller 1991). Many of these authors indicated that both people with dogs on a leash and loose dogs provoked the most pronounced disturbance reactions from their study animals. However, the greatest stress reaction results from unanticipated disturbance. Animals show greater flight response to humans moving unpredictably than to humans following a distinct path (Gabrielsen and Smith 1995). Dogs that are unleashed or not under the control of their owners may disturb or potentially threaten the lives of some wildlife. In effect, off-leash dogs increase the radius of human recreational influence or disturbance beyond what it would be in the absence of a dog. In addition, dog waste is known to transmit diseases that may threaten the health of some wildlife and other domesticated animals. Domestic dogs can potentially introduce various diseases and transport parasites into wildlife habitats (Sime 1999).

Dogs are prohibited from adjacent conservation land owned by The Trustees of Reservations (TTOR) from April 1 through September 15 to protect nesting shorebirds. The TTOR has much more land in which wildlife is dispersed, thereby decreasing the likelihood that an individual pet will disrupt wildlife. At Nantucket NWR, which is only about 21 acres in size, it is much more difficult to limit this disturbance. Additionally, many pet owners fail to keep pets leashed or cleanup pet waste. To ensure the protection of wildlife and habitat and to support the refuge’s establishing purpose in providing for migratory birds, the refuge has determined the presence of pets to be inappropriate on Nantucket National Wildlife Refuge.

LITERATURE CITED:

- Baydack, R. K. 1986. Sharp-tailed grouse response to lek disturbance in the Carberry Sand Hills of Manitoba. Colorado State University, Fort Collins, Colorado.
- Gabrielson, G. W. and E. N. Smith. 1995. Physiological responses of wildlife to disturbance. Pages 95-107 in R. L. Knight and K. J. Gutzwiller, ed. Wildlife and Recreationists: coexistence through management and research. Island Press, Washington, D. C. 372pp.
- Hoopes, E.M. 1993. Relationships between human recreation and piping plover foraging ecology and chick survival. Thesis, University of Massachusetts, Amherst, Massachusetts.
- Keller, V. 1991. Effects of human disturbance on eider ducklings *Somateria mollissima* in an estuarine habitat in Scotland. Biological Conservation 58:213-228.
- Sime, C. A. 1999. Domestic Dogs in Wildlife Habitats. Pp. 8.1-8.17 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society.
- Yalden, P. E., and D. Yalden. 1990. Recreational disturbance of breeding golden plovers (*Pluvialis apricarius*). Biological Conservation 51:243-262.